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Including the Proceedings of the
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XIII JANUARY 14, 1924 NUMBER 1

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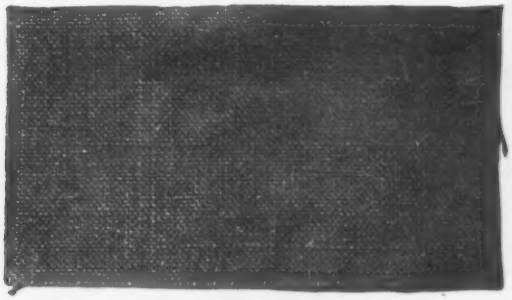

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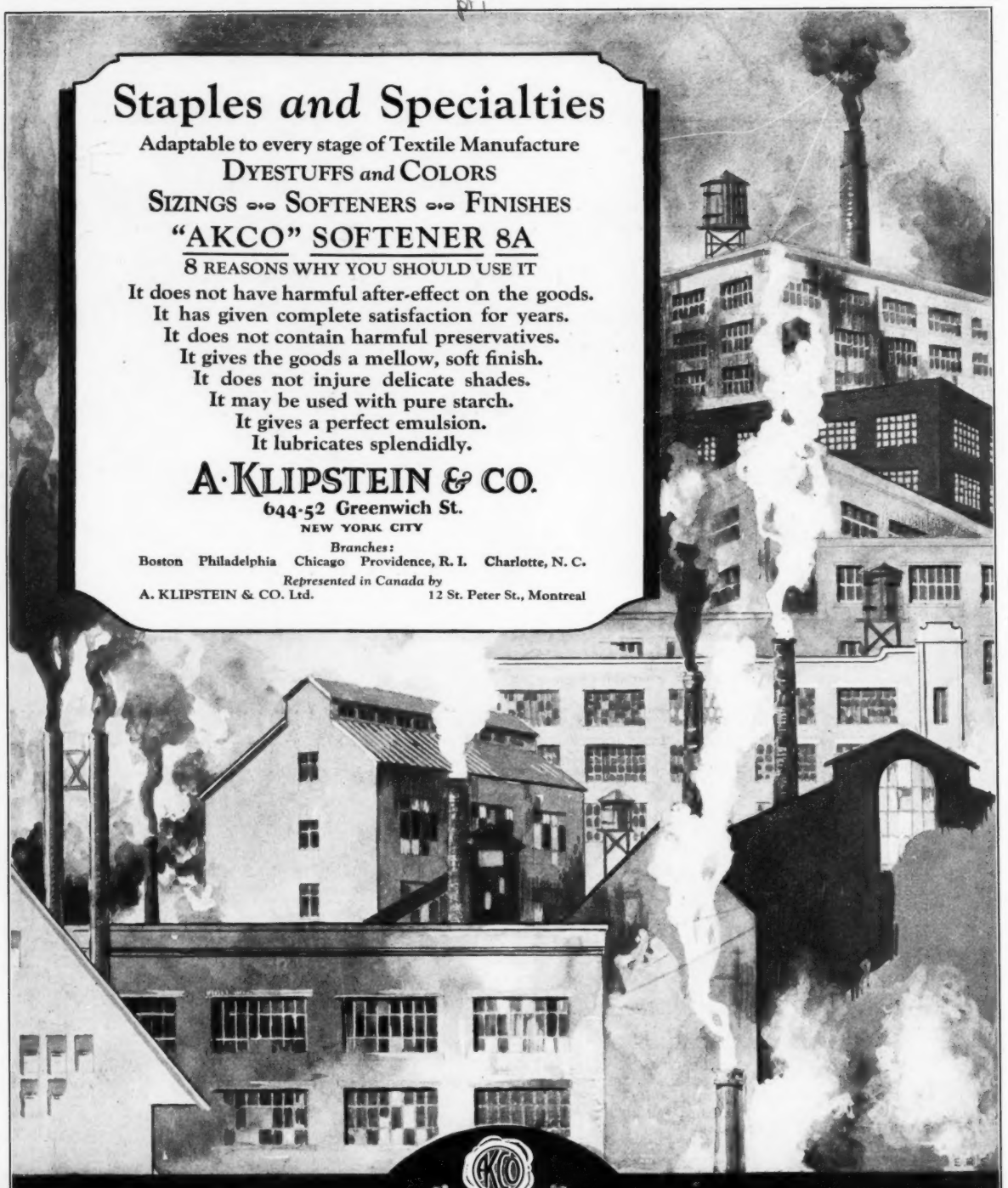

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American Dyestuff Reporter, Vol. XIII, No. 1. Jan. 14, 1924. Published twenty-two times a year by Howes Publishing Co., Inc., Woolworth Bldg., Broadway, New York, N. Y. Domestic subscription, $5.00; Canadian, $5.50; foreign, $6.00. Entered as second-class matter Nov. 6, 1919, at the ...rk, N. Y., Post Office, under the Act of March 3, 1879. Copyrighted, 1923, by Howes Publishing Co.

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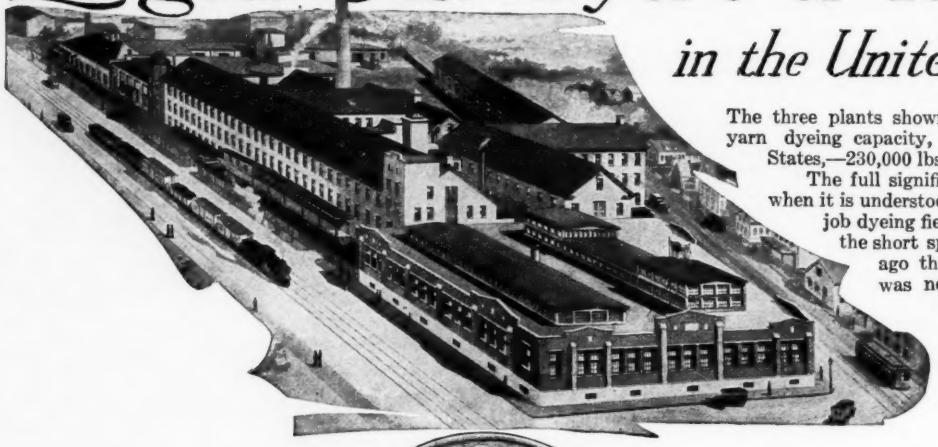

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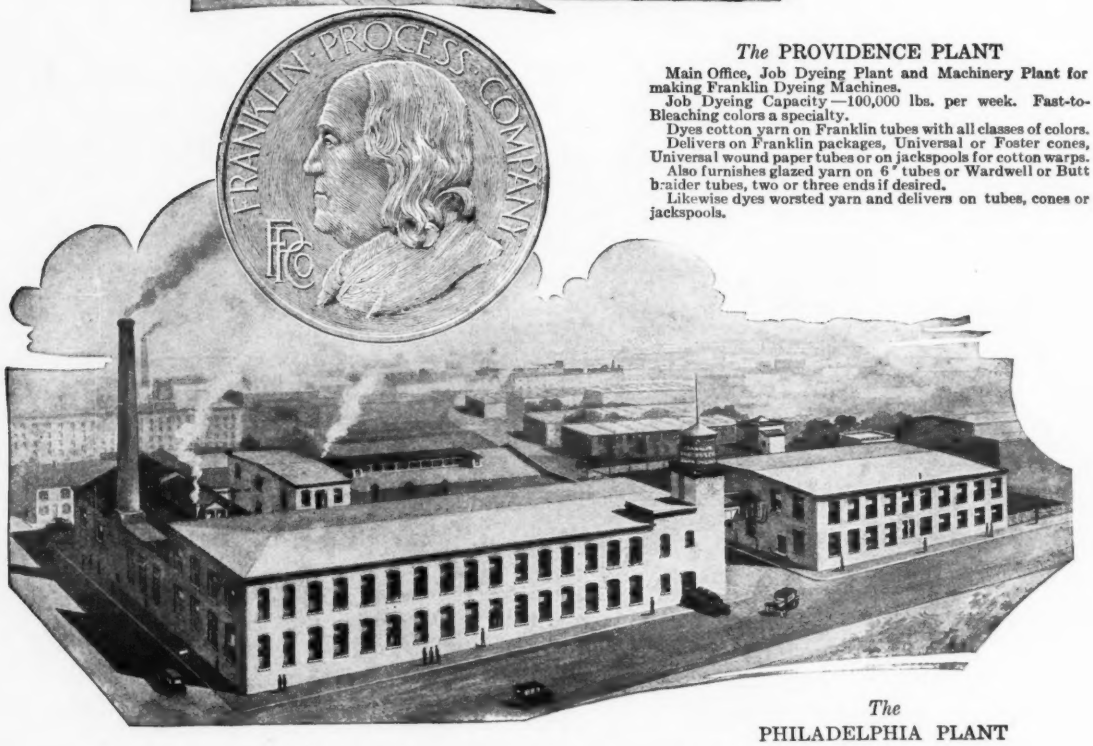

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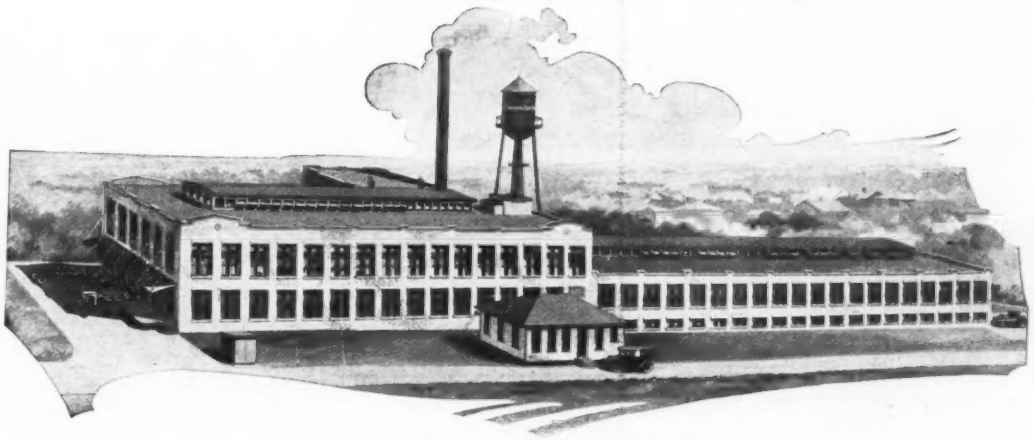

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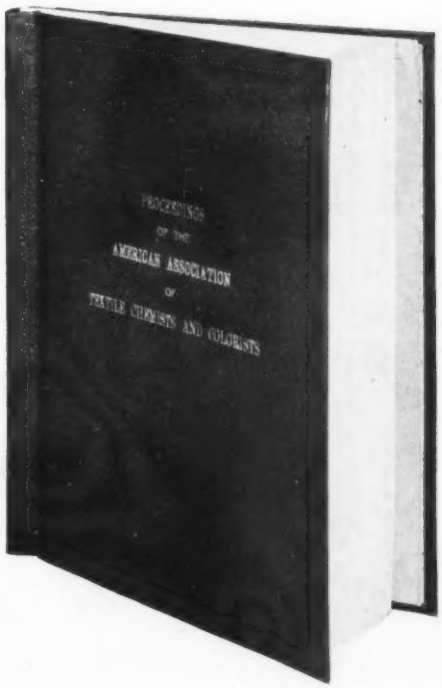

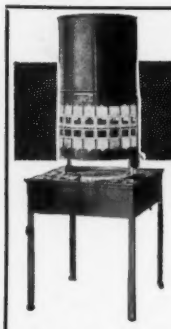

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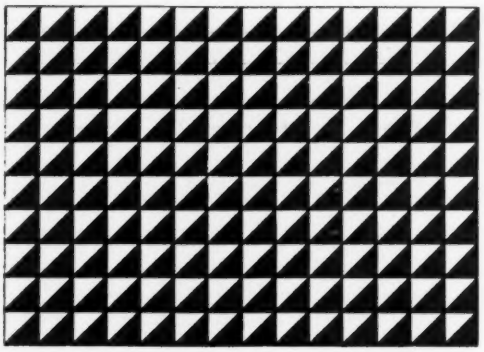

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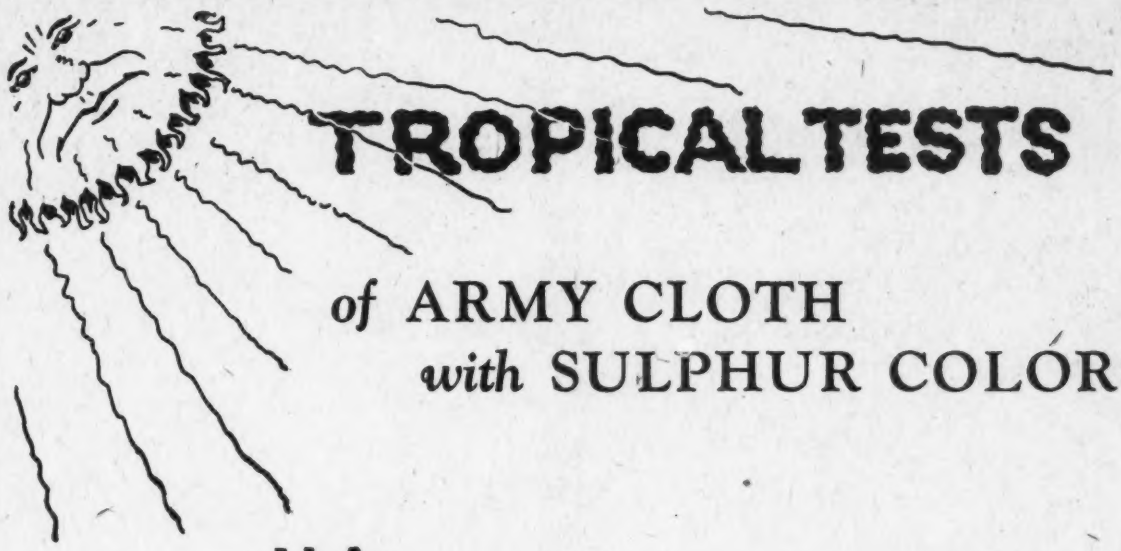

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VOLUME XIII NEW YORK, JANUARY 14, 1924 NUMBER 1

The Bleaching of Cotton Piece Goods

Principles and Problems—Stamping—Sewing—Singeing—Desizing—The Piling Machine—The Washer—Kier Boiling—The Caustic

By WILLIAM F. DEADY

THE cotton finishing plant of to-day doing commission work is confronted with many problems in the bleaching, dyeing and finishing of cloth, owing to the great variety of goods it has to handle. Not only do the goods vary in count, weight and construction, but also in the grade of cotton used, the imperfections, and the amount and kind of sizing put in by the gray mills. Deliveries and costs are two additional problems which require special attention, owing to the close competition between bleacheries. To draw up a definite formula for the solution of these problems would be a very difficult undertaking.

In bleaching there are, however, certain fundamental principles which hold good in most cases, such as the proper inspection of gray goods, the thorough removal of the sizing material and the softening of the cotton waxes before the goods enter the kier, a good boil and a good bleach, in the shortest possible time, with the least amount of handling and labor. With these principles in mind, the following notes may be of interest.

Stamping and Sewing

The goods enter the gray room in bales, which are opened there, and a piece or two from each bale carefully inspected as to width, count, weight, etc. The pieces are checked for yardage, and laid out on skids, face up if necessary, with the ends laid out for the sewer, who sews them end to end, making one long piece. The goods continue in this form throughout the whole process. The lot number is stamped on the end of each piece in the gray room, so that after bleaching, the various customers' goods may be identified. The substance, mostly coal tar, which is used for stamping, withstands the bleaching action.

Singeing

After sewing, the goods are ready for singeing (with some classes of goods this operation is omitted). The singeing consists of the removing of the fuzz and loose strings from the face, or the face and back as the case may be, by passing the cloth rapidly through a series of gas flames, or over a red hot copper plate. For most work the gas singer is replacing the copper plate.

The newest feature in this gas singeing process is the method of introducing the gas. Instead of using gas and compressed air, or mixing the proper proportions of gas and air and then pumping the explosive mixture to the singer, the gas itself is compressed to a certain pressure; the compresser may be located at any convenient place in the plant and the compressed gas piped to the singer. Each burner is connected to the main line similar to Fig. 1. A one-half inch pipe (A) drops from the main pipe (M) and is fitted with a valve (B) and a pressure gauge (C) as shown. The gas in the main line may be at any desired pressure, and by proper manipulation of valve (B) may be made to produce any desired flame at the burner. The flame may be duplicated at any time by simply using the same pressure. This is a feature that was not as easily controlled in the other processes.

The gas passing through valve (B) continues down pipe (A) to an orifice (D) where it is allowed to expand through a tapered tube (E), from which it enters the burner. A housing is placed around the orifice (D) with an air opening at the bottom as shown. The gas in expanding creates a suction which sucks in air through the air vent, and mixes it with the gas; in other words, the action resembles the action of a carburetor on a gas engine. By careful adjustment the most efficient mixture of gas and air may be sent to the burner which will burn with a short blue flame of intense heat. The burner slot has to be of the proper diameter to prevent backfiring. The air in the singe house may contain considerable lint and dust which would soon clog up the burner slot, but this may be overcome by piping in outside air directly to the air vent. This method needs no further attention, which would not be the case if screens were used to filter the singe house air. They would soon clog up with lint and constant care would be needed to keep them clean.

Desizing

After leaving the flame the goods pass into a diastase solution where they are impregnated. This solution is kept at 145 deg. to 150 deg. Fahr. (between these temperatures the maximum enzymic action is produced) by a steam coil fitted with a control valve and may vary in strength from one-quarter to 1 per cent. according to the class of goods and is slightly on the acid side. The excess liquor is squeezed out and the goods run in the rope form into a piling machine. The solution also extinguishes any sparks of burning strings from the cloth.

Piling Machine

The piling machine consists of a J-shaped chute (A) with a series of rollers (B) at the bottom known as the Gantt, or still another type where the rollers are replaced by a traveling apron worked on an endless chain over a series of sprockets (C) and wheel (D). The latter is better adapted for light goods. The cloth entering the top of the machine over a drum (F) passes through a traveling poteye (E) which works by a connecting arm (I); this gives it a crosswise motion. After leaving the poteye it passes over a revolving reel (G) which moves backward and forward. The combination of these two motions of the reel and poteye plaits the cloth very neatly in the chute, thereby preventing tangles when the cloth arrives at the delivery end of the piler (H).

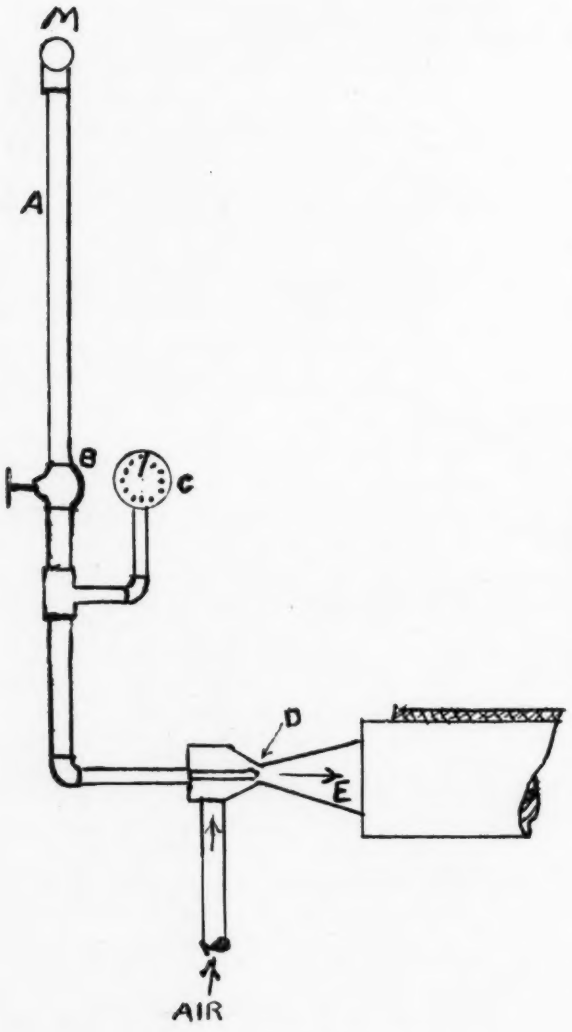

Fig. 1.—*Burner Connection*

The entire piler is housed in a steam-heated compartment, making sort of incubator, which is kept at 145 to 150 deg. Fahr. This is done to hasten the action of the malt enzymes in converting the insoluble size starches to soluble sugars, by maintaining a warm moist atmosphere about the cloth as it lays in the piler. It has been found that the action is most complete in one hour under these conditions; therefore, the size of the piler and the speeds of the preceding singer and succeeding washer are planned so that the goods entering the top of the piler will remain an hour before entering the washer from the delivery end.

The Washer

The washer (illustration page 4) accommodates about 24 strands of cloth and is of the loose strand type. This type is preferable to the log boiler type because it does not exert such a pull on the goods, which rips the seams on light goods and frays them. Most important of all, it enables the finisher to get the required width much easier on his tenter frames without damaging the selvages of the lighter goods. The cloth passes over a large hexagonal drum (A) at one side of the top, then under a similar drum (B) situated in the middle just above the water line, then over a similar drum (C) on the opposite side, from which it falls loosely to the bottom of the washer. It then passes under two brass bars (D and E) placed on opposite sides of the bottom, thus causing the strand to be in contact with the water for the full width of the machine. It then moves up to the top drum and is ready for another cycle, a peg rail (F) guiding it to keep each strand in its own compartment.

To use hot water, the most efficient solvent, it was necessary to section off each strand by a wooden partition, with holes bored at alternating ends. Thus, the clean water entering the delivery end would flow in a zigzag course through the partitions to the outlet. By this method, the maximum of cleaning could be done with a minimum of water.

Kier Boiling

After leaving the washer the goods passed through a squeezer to wring out the superfluous water. At this point they were sprayed with cold water to cool them down, so the kier boy would not be too warm while plaiting down in the kier. With an automatic kier plaiter

this latter is unnecessary, and the goods are piled more evenly than by hand, thus insuring better circulation of the kier liquor and therefore a more uniform boil. More goods can be packed in a given size kier with the hand piling, however.

The goods now entering the kier are practically free from size and loose dirt, and the cotton waxes have been softened, leaving them more open to attack by the caustic soda used in the kier boil; cleaning the goods in this manner, and careful plaiting in the kier cannot be too strongly emphasized, if good, even kier boiling is desired. Some bleacheries labor under the impression that the elevated temperature of a pressure boil will convert the insoluble size starch to soluble dextrine, and therefore, it is not necessary to remove it before entering the kier. It is true that dextrine is prepared by heating starch alone or in the presence of a slight amount of acid; but with caustic soda, a wax-like substance similar to parafine, which is known as apparatine is produced. It is very difficult to remove this substance from the goods, bleaching and souring having no effect, and it will cause trouble when the goods are dyed; the filling threads taking up the color readily while the warp or sized threads absorb very little color, the color being deposited simply on the outside of the thread. In some cases this is an advantage, such as in stripes, figured Jacquard or fancy dobbie effect; where the filling effects show on the face the figure will be darker than the plain part, and warp effects will be lighter. In either case the slight difference in shade tends to bring out the figure, but plainer weaves which require calendering during finishing are at a disadvantage, because the pressing by the calender rolls tend to flatten the threads, thus bringing out the undyed portions, which cause the resultant shade to be considerably lighter than the original.

The even plaiting in the kier will prevent channels be ing formed when the kier is boiled. So-called channeling is caused by uneven pressure of the cloth in various parts of the kier, and as the liquor percolates through the cloth it tends to follow the lines of the least resistance and will flow through the part that is more loosely packed and completely remove the pectic matter while the tightly packed part receives very little liquor; consequently the waxes on this part of the cloth are not completely converted and removed. With white goods this is not such a serious matter, but with dyed goods these places will show up as white resisted spots after dyeing. For goods that are to be pad-dyed the bleach and boil must be perfect because the goods are in the liquor only a fraction of a second; therefore, rapid absorption of the dye is necessary to prevent streaky goods.

The size and make of kier may differ with the class of work handled by any particular bleachery. For a plant doing fine goods such as organdies, voiles, etc., a kier of 5,000 pounds capacity would be most satisfactory as it will hold 30,000 to 50,000 yards of this kind of material; while a plant handling heavy, bulky goods such as drills, corset cloths, osnaburgs, etc., will require a 10,000-pound, or in some cases, a 20,000-pound kier. The size of the kiers and the piling machines should be determined by the average weight of the material handled, so that the minimum number of machines will turn out maximum production. If large kiers are used for fine work it takes considerable time to load and unload them, causing the kier to be idle for a long period. If large kiers are used for fine work it takes considerable time to load and unload them, causing the kier to be idle for a long period. If such a kier boils poorly, which does happen now and then even under the most careful supervision, it holds up production in the other departments, which in a small plant would be inefficient.

Each kier should be covered with asbestos to prevent loss of heat by radiation. A temperature recording thermometer should be placed on each kier. This device will give a complete record of the length of time the kier boiled and the temperature and pressure it boiled at. In many cases it will greatly aid in solving kier troubles and also act as a check on the kier boiler. Therefore,

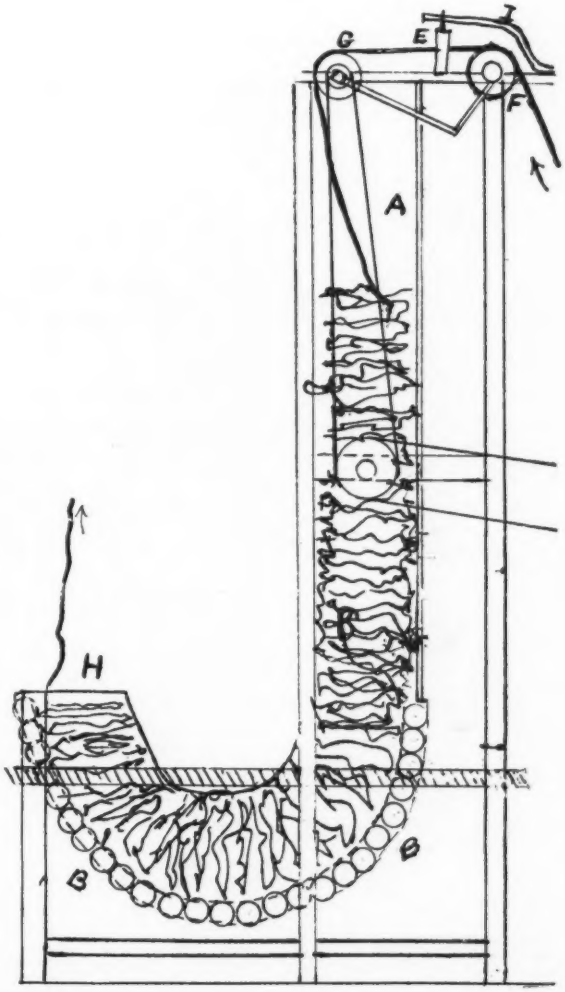

FIG. 2.—*The Piling Machine*

with the strength of the liquor constant and the temperature pressure and duration of boil constant, more uniform kier boiling or bottoming may be expected.

The strength of the caustic may vary with the grade of goods to be boiled. Of course, one may say a pound of cotton is a pound of cotton whether it is woven into 12 yards of organdie or 1 yard of 16-ounce duck, and each will contain the same amount of cotton wax to saponify, but in actual practice it is found that there is a difference. For instance, a kier of organdie may boil well in a 2 per cent solution of caustic soda, while a kier of duck will boil better in a 3 per cent solution, other conditions being equal. Of course, it is better to use the minimum of caustic, both as an economic factor and for the feel of the goods. The stronger the caustic, the harsher the feel of the goods boiled in it. Many plants utilize the weak wash waters from their mercerizing machines in making up their kier liquor while some use new caustic. The former is more economical if the washings are kept clean. Whichever method is used, I cannot too strongly advise testing each batch of kier liquor for strength by titrating with standard acid instead of the haphazard way of twaddling.

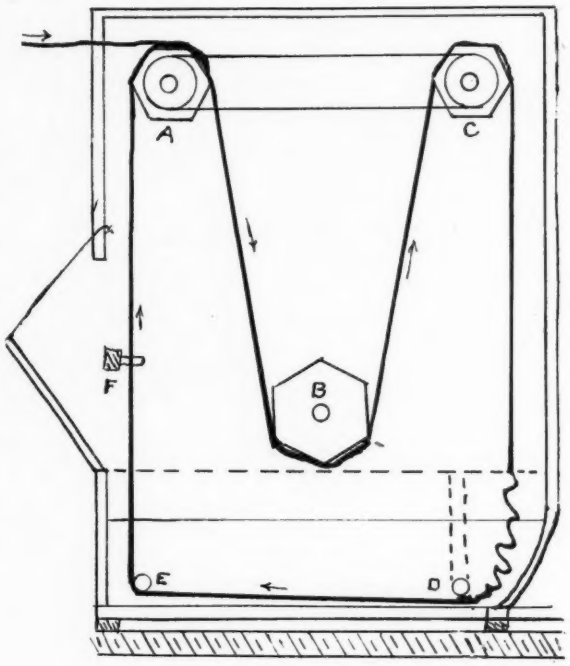

FIG. 4.—*The Washer*

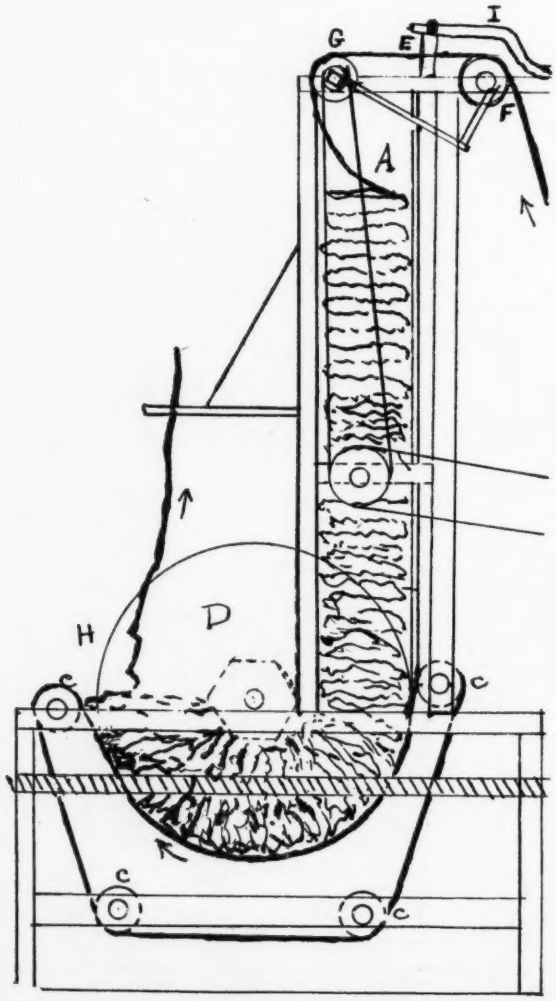

FIG. 3.—*A Second Type of Piling Machine*

As some of the wax in cotton is not saponifiable in caustic soda it is necessary to use an assistant to aid the caustic in the removal of this wax. Various soaps and oils are recommended, as well as sodium silicate, sodium carbonate, and various organic solvents. All are good in one way or another, but for a general all-round formula the writer would suggest a good grade of caustic soda as free as possible from sodium chloride, sodium sulphate, etc. (as these retard the saponifying action), with a small amount of sodium carbonate and a small amount of a good grade red oil soap or red oil itself. The soap and the carbonate, having more of an emulsifying action, will tend to remove the portions of wax which the caustic fails to saponify; this also helps to emulsify the mineral oils used in the sizing by some gray mills, as well as the machine-oil spots found in some pieces. Many times these cannot be thoroughly removed and cause resists when dyed.

(*This article will be concluded in an early issue*)

Imports of coal-tar dyes through the Port of New York during the year 1923 totaled 2,631,341 pounds, valued at $2,718,124, according to the joint monthly report issued to-day by the Committee Department. For the month of December imports of coal-tar dyes through New York amounted to 202,704 pounds, valued at $212,851.

The following imports were reported for other ports: Boston, 8,557 pounds, valued at $16,887, and Philadelphia, 3,625 pounds, valued at $3,126.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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THIRD ANNUAL MEETING

SATURDAY MORNING SESSION

December 8, 1923

(*Continued from issue of December* 31)

President Olney—I think we had better pass on to the next paper, and then if there is time we will come back to the discussion on olive drab.

Artificial silk so-called is a very important commercial product to-day, and it was suggested that this be made one of the subjects to be taken up at this meeting. We thought in all fairness that we should have someone represent each type of the manufactured silk. It was necessary to publish our program before we were certain that we could get someone to talk in regard to each type, and I think there is still some uncertainty about this. However, we have represented here to-day the cellulose acetate silk, and I hope also the collodion and viscose silk. Cuprammonium silk is being made in this country at the present time, and I understand that it is of growing importance, and if there is anyone here who can speak in regard to that we should be pleased to have him do so, although this type appears to have been omitted from the program.

We will first have the subject of cellulose acetate silk presented by Royal Little. Mr. Little, as many of you know, is associated with the Lustron Company, in Boston. Mr. Little! (Applause.)

BLEACHING, DYEING AND FINISHING OF ACETATE SILK

By Royal D. Little

Mr. President, Members of the Association: Before starting this talk I want to make a couple of statements.

In the first place, unfortunately, I am not a technical man, so that my vocabulary of tongue-twisting chemical terms is rather limited. In the second place, the information which we have on acetate silk was gathered largely through our five years' experience in a practical way with the development of our product in this country. That has supplemented in a large way the excellent research work of H. S. Mork, who has done the technical development work along these lines. He undoubtedly knows more about acetate and its uses for artificial silk and other purposes than any other man in this country.

One other thing: In order to save time there is one experiment I want to show during the talk and I am going to ask Mr. Francis to just start carrying this out at the same time that I am talking. I had planned to have it afterwards, but by doing it in this way it will save a little time. It may make it seem a little bit like a two-ring circus, but it will save that much time.

Before taking up the subject of bleaching, dyeing and finishing acetate silk it is of interest to observe that there are at present on the market at least two types of acetate silk of distinctly different chemical and textile properties. It may seem curious, on first thought, that this should be true, but when it is considered that cellulose acetate can be made in several

different manners and that there are fundamental differences in the manufacturing operations involved in making the silk from the acetate, it is not so remarkable that the characteristics should vary widely. On account of these differences, I am going to refer to the two types of acetate silk by their trade names to prevent confusion.

They are Celanese, manufactured in England by the British Cellulose & Chemical Company, and Lustron, the product of the Lustron Company, with which I am connected. It is, of course, natural that on account of my association with the Lustron Company I should have far more intimate knowledge of acetate silk of this type than of Celanese. There is an immense amount of literature, especially in British journals, on the dyeing of acetate silk of the Celanese type. Many excellent articles on this subject have appeared in the Journal of the Society of Dyers and Colourists, as well as in your own publication, The American Dyestuff Reporter. As there has been very little published information of a detailed sort in regard to Lustron, I may possibly be able to bring out a few points of novelty and interest.

As is the case with Celanese, Lustron is naturally an excellent resist to most Acid, Direct and Union colors, and can consequently be cross-dyed into two-color effects with any other fiber or fibers, and into three colors with any other two fibers which will already cross-dye. Lustron is used almost exclusively in piece-dyed goods, and its use is recommended for cross-dyeing into two and three color combinations rather than for solid shades. Celanese, on the other hand, is extensively skein-dyed, especially in the finer deniers for use in solid colors both by itself and in conjunction with other fibers. Lustron can, nevertheless, be readily yarn-dyed in any required shades, and, by the use of selected dyestuffs, colors of excellent fastness to scouring, fulling, silk boil-off and cross-dyeing are obtained.

As can be readily appreciated, cellulose acetate, being an ester, behaves quite differently to chemical action and heat than cellulose. It is, therefore, extremely important that these fundamental characteristics be thoroughly understood by the colorist. The alkaline saponification of acetate is accompanied by loss of resist properties in direct proportion to the extent of saponification. It is also interesting to note that as the saponification progresses there is a large increase in the fiber's dye rate in terms of basic colors, as well as its ultimate capacity for them. Acid hydrolysis affects acetate in much the same way in the initial stages as alkaline saponification, but upon being carried to an extreme there is an actual disintegration of the fiber very similar to that which occurs in the case of cotton when sulphuric acid is left in it.

For the handling of Lustron goods the following recommendations are made:

Fabrics containing Lustron and fibers other than real silk are scoured with 10 per cent neutral soap on the weight of the goods for fifteen to thirty minutes at a maximum temperature of 175 deg. Fahr. Never use caustic soda, and if the character of the goods demands some alkali, from 1 to 2 per cent of soda ash or small quantities of ammonia may be used.

Lustron fabrics containing real silk in the gum may be boiled off in one or two changes of a ¾ to 1 per cent neutral soap solution for about one hour without danger of impairing the brilliancy of the Lustron.

Bleaching

Lustron and cellulose fiber unions are best bleached by the following Sodium Hypochlorite method:

Stock Solution—Ten pounds hypochlorite of lime, 6 pounds soda ash in 50 gallons water. Let settle and use clear liquor.

Bleaching—Make up bleach liquor to stand at ½ to ¾ deg. Tw., using above stock solution. After scouring, the goods should be bleached at 25 to 30 deg. Cent. for one hour. Rinse lightly. Sour in a cold ½ per cent solution of acetic acid for fifteen to twenty minutes. Wash till about neutral, then neutralize in a bath of ¼ per cent bicarbonate of soda solution for one hour. Whiz and dry without rinsing, or if to be dyed rinse and dye.

When real silk is a component of the fabric, use the following peroxide of sodium method, complying with the directions carefully:

Bleach Bath—One hundred gallons of bleach bath are prepared as follows: To each 97 gallons of cold water add 5½ pounds of sulphuric acid 66 deg. Be., free of iron. Then sprinkle peroxide of sodium slowly into the bath, either directly from its tin or from a scoop, at the same time stirring the bath constantly so as to prevent undissolved peroxide powder falling on the bottom of the vat. Start to heat the bath up slowly to 100 deg. Fahr. when about half the amount of peroxide of sodium is added. Continue the addition of peroxide while heating the bath until same reacts neutral—i. e., until neither red nor blue litmus paper changes color.

About 4 pounds of peroxide of sodium should be

required to bring the bath to the neutral point. After this point is reached, heat the bath up to 120 deg. Fahr. and add 2 pounds of Monopole oil. Stir the bath well and bring the goods and the bleach bath together as quickly as possible.

Keep the temperature of the bath at 120 deg. throughout the bleaching period.

Bleach until the proper shade is obtained.

Wash the material first with warm water (not exceeding 120 deg. Fahr.) and finally with cold water.

Mercerizing

It is often desirable to mercerize in the piece Lustron decorated cotton goods. This can be done in the usual mercerizing range with caustic soda solution of 13 to 15 per cent strength. Care should be taken to have the mercerizing bath as cold as possible, not over 40 deg. Fahr. In washing out the caustic soda, cold, and not hot, water should be used in the spurt pipes. Besides the water box, the range should be equipped with an acid box so that the goods can be run directly into the weak acetic acid—sulphuric should never be used. After coming off the range the goods should be thoroughly washed, and if they are going to lie around any length of time before dyeing they should be neutralized with a weak bicarbonate of soda solution.

Dyeing

Lustron has a remarkable affinity for the basic colors without mordant and can be dyed from a neutral bath, a slightly acid bath, or in the presence of common salt. The dyeing conditions vary according to the particular requirements. For instance, either acetic acid or common salt in small quantities retard the dyeing rate of the basic colors on Lustron. Acetic acid can be used where it is particularly important that other fibers present should not be stained by the basics. If no retarding agents are employed, the Lustron dye bath must be started cold to prevent the color going on the fiber too quickly. The bath is gradually raised until it is practically exhausted and the other fibers are clear. One interesting feature is that 1 per cent of practically any basic color will give a deep shade on Lustron.

In cross-dyeing Lustron and other fibers, such as cotton, it is important that the acetate silk be dyed first, as direct colors on cotton will mordant the basics.

I have an example here that may not show very clearly in the back of the room, but in this case the Lustron which is the blue was dyed first and then the Viscose, which is in the center, and the cotton on the back was dyed secondly. The result is that you get a good clean yellow. On the other hand, here you can see that the blue has shaded onto the Viscose because the process was reversed; the Viscose was dyed first and then the basic color applied. In that case the basic color was mordanted by the direct color on the Viscose already.

In a fabric containing Lustron and viscose, for example, where the basic bath is started cold, the viscose absorbs much of the basic color at low temperatures, and as the temperature is raised the dyestuff transfers gradually onto the Lustron.

I have here an example of that. This whole piece (indicating) was started cold. It all looked like this end at first. This middle band is the Lustron; the two outside bands are the Viscose. Then the goods were held in the bath like this, this part out, the remainder in the bath. The temperature was raised and the dyestuff transferred from the Viscose onto the Lustron, leaving the Viscose clear.

It is important, therefore, to bring the dye bath to a temperature sufficiently high to insure the viscose or other fibers being clear. In this connection it is possible, if necessary, to raise the dye bath to a boil without affecting the luster of the Lustron. Should the other fibers still be badly stained after boiling the basic dye bath, a small quantity of acetic acid added at this point will clear them nicely.

In dyeing cotton or other fibers and leaving Lustron white, it is, of course, necessary to select dyestuffs which do not stain the latter. In the case of the vegetable fibers, as a general rule, those direct colors which leave real silk white do not stain Lustron, although there are many colors, such as Chrysophenine, which leave Lustron white that will dye real silk. As regards the acid colors which would be used to dye animal fibers in the presence of Lustron, there are very few of these which stain the acetate silk at all. In using basics to cross-dye Lustron with any other fiber, a two-bath method is usually advisable for better control of shades, although considerable success has been obtained in single baths.

I have here a set of samples all of the same grade goods in which the colors were applied by single-bath method. I will have to turn these over as I show them. That is all the same piece of gray goods cross-dyed by single-bath method.

In dyeing three-color combinations, such as Lustron, viscose and real silk, the Lustron should be dyed with basics first in a slightly acid bath, the viscose second in a slightly alkaline bath with direct color and salt, followed by the real silk with acid color in a slightly acid bath with salt.

I have a small set here that shows the transitions in this dyeing method. For instance, here is the gray goods.

This happens to contain tussah or the real silk, Viscose next, then Lustron and then Celanese, these two on the end being the two types of acetate silk, that is, after the silk boil-off. The first process is dyeing the Lustron. This shows the Lustron after it is dyed with the basic color on which the other fibers are left white. The next process is dyeing the Viscose or the cellulose fiber. In this case the Lustron is still dyed its original color; the blue has gone onto the Viscose, and the Celanese is still white. The cotton on the back is dyed. The last stage is after the real silk has been dyed; the Celanese is still white; the Lustron is gold; the Viscose is blue, and the tussah is a reddish color.

In order to save time, I am going to just start an experiment here. This may seem somewhat like a lesson in prestidigitation, but I am just going to take a piece of gray goods which I showed you as the boiled-off fabric containing real silk, Viscose, Lustron and Celanese. This, which doesn't look like much, is a little piece of Jacquard pattern fabric with a real silk warp, with alternate picks of Lustron and Viscose. I am going to let Mr. Francis dye those while I go on. What I am attempting to do is to get a three-color effect on one and a four-color effect on the other in one immersion in the dye bath. This is what we are using (indicating bottle). It contains Acridine Orange, Direct Fast Scarlet 4 BA, Patent Blue A, and a little common salt.

Here are a couple of interesting samples showing Lustron and Viscose on silk goods, silk warped fabrics. Those two pieces are the same gray goods, dyed to different colors. Here is another little set, the same thing —that combination and this one here are the same thing It just shows the combinations it is possible to get on the same gray goods.

Upon the completion of any Lustron dyeings, the goods should be rinsed for fifteen minutes cold in a solution of ½ ounce bicarbonate of soda per gallon of water. They should then be extracted and dried without further rinsing. This after-treatment is an insurance against the goods being left acid, and is of the utmost importance.

Dyestuffs for Lustron

The basic colors on Lustron show good fastness to soaping and excellent fastness to acids. Some of these dyes also show good fastness to light, the order of which is noticeably different from the same dyes on cotton.

Good Light Fastness—Turquoise Blue, Setocyanine, Capri Blue GON, Cresyl Blue 2RS, Victoria Green WB, Methylene Green B, Brilliant Green B.

Fair Light Fastness—Cresyl and Methyl Violet, Fuchsine, Fast Blue RS, Thioflavine T, Auramine.

Other basic dyes show moderate to poor light fastness.

Lustron can be dyed by a few acid and acid mordant colors, such as Acid Rhodamine 3R, Azo Yellow A5W, Coomassie Fast Violet 10BP, Alizarine Yellow R, Alliance Fast Brown 5G, Terra Cotta RS, Anthracene Blues, Anthracene Browns.

These are dyed with the addition of a small amount of acetic acid and 10 to 15 per cent common salt.

It is also possible to dye with some of the alizarine colors, such as Alizarine Blue S. As, however, most of these colors dye two shades, depending upon whether the treatment is acid or alkaline, it is somewhat doubtful how practical their employment in volume would be.

We have these two types of acetate silk. As you saw in the other fabric the basic colors go onto the Lustron much more readily than they do onto the Celanese. This is just another type of dye; it happens to be a Pyranine G, which is dyed neutral, the center band being the Celanese, the two outside bands being the Lustron. That is the general tendency with the basic colors. On the other hand, in connection with the Ionamine colors which have been developed in England for use on the Celanese type of acetates, the Celanese has a greater affinity for these Ionamines than the Lustron has, as is shown by these samples, where the Celanese is the center band. This one is Ionamine L dyed direct; this is Ionamine B. They are both dyed some, but there is a difference there, the Celanese taking more of the dyestuff than the Lustron does.

The Ionamine and Azonine developed colors, which are used extensively on acetate of the Celanese type, can also be used to advantage with Lustron. The Ionamines can be used both developed and undeveloped. There are also some few shades which are obtained on Lustron by dyeing the ice color intermediates on the fiber, then diazotizing and developing.

Special Dyeing on Cotton in the Presence of Lustron

Sulphur colors can be dyed on cotton leaving Lustron unstained, if the temperature is below 75 deg. Fahr. and the sodium sulphide is slightly reduced.

In hosiery and wash goods it is often of advantage to diazotize and develop colors on cotton, leaving Lustron white. It is, however, necessary to use Naphthol AS in order to do this, instead of the usual developers, such as beta-naphthol, which stains Lustron red, due to basic impurities.

The Indanthrene colors are not recommended for general use on Lustron, and have only limited application on union fabrics containing Lustron and other fibers.

It might be said there that on account of the alkalinity of the bath it is very possible that the Lustron will be saponified and stained by the Indanthrene color used.

In dyeing Lustron fabrics, the following points should be borne in mind above all else:

1. Keep the alkalinity of the scour as low as possible.
2. Never use sulphuric acid, acetic being preferred in all cases.
3. Always give Lustron goods the bicarbonate of soda after-treatment.

Finishing

There are two precautions in connection with the finishing operation which should be observed in goods containing Lustron. In the first place, never stretch Lustron filled goods over gray goods width. Secondly, do not run Lustron fabrics on bare copper cans previous to tentering. Also, do not run them through hot calenders. If these precautions are followed, tendering of the fabric will be eliminated.

In summing up, I wish to bring out one important point, which is: In handling any goods containing acetate silk, determine first which type of acetate is involved, and then follow with intelligent care the directions essential for success with that particular fiber.

I might add that I have some samples which I will be glad to show you after the meeting is over, if anyone would like to see them.

Here is this Jacquard pattern fabric which we have just dyed; it shows three colors after a single bath. There is the one with the four colors. You can see the difference between the yellow and the white.

Thank you. (Applause.)

President Olney—I think some of these color effects in a one-bath process have been a revelation to many of us. They surely have been to me and I think this has been a very interesting and profitable paper. However, we had better deter the discussion until we have heard in regard to these other silks. We have had some difficulty in getting speakers in regard to them. In one instance, I think three different ones have been on the list and one after another for some reason or another they have been unable to come. I would like to know if there is anyone present to speak on Collodion silk. I might say that if there is anyone here who is acquainted with that fiber and its dyeing, bleaching, and so on, we should be pleased to hear from him, even though he has not been officially asked to speak upon the subject and may have but little to say.

In regard to Viscose silk we have on the program "representative of Du Pont Company." If such a representative is here, we should be pleased to hear from him. That is rather indefinite but we endeavored to secure a man from that company knowing that they were extensive manufacturers of Viscose silk. We also endeavored to secure some one from the Viscose Company.

Then again (though this is not on the program) is there anyone here that can say something about cuprammonium silk, which in its properties, of course, is very similar to the Viscose silk, as far as dyeing and bleaching are concerned?

There being no one to speak on these other subjects, we will open the discussion on Mr. Little's paper. I am sure Mr. Little will be pleased to answer any questions you may ask. There certainly must be someone here who has an inquiry to make, after that very interesting paper.

W. S. Williams—I would like to ask if Mr. Little would tell us the difference in process of manufacture between those two acetate silks.

Royal Little—I can't go into great detail on it but the acetates involved in the first place are different.

As you probably know, there are the mono, di, tri acetates, etc., and in making acetate silk you probably get an assortment of the various kinds. So that you have differences there. Then there is a possibility of differences in solvents and differences in spinning processes. In other words, you can spin by an air method or you can spin in a setting bath and all of those things give different characteristics to the silk when it is finally made.

Hugh Christison—I would like to ask Mr. Little if the Lustron silk has the property of preventing wearing out of a garment. For instance, we have made men's suitings with Viscose silk and at the bending of the elbow or the knee, the Viscose silk has entirely disintegrated, so that the stripe has entirely disappeared in spots. Is the Lustron silk stronger mechanically so that it will not disintegrate in a suit?

Royal Little—I can probably answer that by showing samples. Lustron is used extensively for stripings in a cheap class of dress goods which are union dyed. They use the cotton warp and a cheap shoddy filling. For instance, last year there were 6,000,000 yards of these Lustron decorated cheap goods made. You can't see the striping (showing piece of cloth) but it is a cheap piece of fabric in which they want the union dye, and in which the Lustron is the only thing which acts as a natural resist. And it has worked out very well in that way.

That may answer the question, in showing that there have been great quantities of this fabric made and used with no complaints of that sort having been heard.

I might add though that the initial physical properties of Lustron are practically the same as those of other artificial silk with the exception that it is much

stronger when wet. That is a characteristic of acetates.

Hugh Christison—Could Mr. Little tell us how to distinguish those if we had them submitted to us?

Royal Little—That is a very simple matter. If you have a match in a match box you can always tell the difference between different kinds of silk. Cellulose silks will always burn like cotton, leaving no ash. The acetate silks will melt rather than burn, very much in the manner of real silk, and you can distinguish between acetate silk and real silk by the smell, silk, of course, having the animal fiber smell when it burns.

Mr. Christison—How would you distinguish between the two classes of acetate silk?

Mr. Little—You could distinguish by dye tests such as I showed you on these fabrics.

President Olney—Is there any further discussion or any other question? If there is no further discussion on this subject we will pass on to the next paper, "Training of Textile Chemists," by J. F. Warner. Is Mr. Warner present? I think Mr. Warner is not present at this moment.

The next subject on the program is "The Continuous Raw Stock Dyeing of Cotton," speaker to be announced. We had hoped that Mr. Brandwood would come here and speak upon this subject, but he was unable to do so. I think there are other men here who have had some experience along that line and we should be pleased to have them open the discussion.

There is one other very important subject that is not on the program for two reasons: In the first place, we did not know where it would fit in to the greatest advantage; and in the second place, in the final make-up of the program it was accidentally overlooked. I refer to the subject of standard methods. I was rather hoping that the session this morning would be shorter than we anticipated so that we could take this important matter up now as there surely will not be time this afternoon. This subject, I think, is wholly independent on the last one on the afternoon's program, "The Future Research Policy of the Association." I think the two have been confused in a way. We might well at this time have at least a tentative report from the Sub-Committee on Fastness to Light. Is Mr. Cady ready to give us a report in regard to the work of his committee? Mr. Cady. (Applause.)

PRELIMINARY REPORT OF THE SUB-COMMITTEE ON LIGHT FASTNESS

Submitted by WM. H. CADY, *Sub-Committee Chairman*

Your Committee have now been working over a year on the problem of standardizing methods for testing the fastness of dyes to light, but although much work has been done and some results obtained, comparatively little has been accomplished to date. We decided at the outset to make a careful test of all artificial lamps now in use or recommended for fading purposes, to find out if any one of these could be considered an adequate substitute for the sun; that is, producing the same relative degree of fading as the sun on all sorts of dyes. For this purpose a series of forty dyeings was prepared, thirteen on wool, fourteen on cotton and thirteen on silk, and subdivided into twenty-one sets. Of these sets, four were exposed to sunlight in different localities; seven were exposed to the "Violet Carbon Arc," the type of lamp used in the so-called "Fadeometer"; six were exposed to Mercury Vapor Arc lamps; two were exposed to the "Snow White Carbon Arc"; one was exposed to an incandescent lamp; one exposure is still incomplete.

Since the Violet Carbon Arc [1] is probably the most generally employed of all artificial lamps at present, we devoted considerable attention to it in order to ascertain not only its relation to sunlight but also whether identical dyeings exposed to two or more of these lamps for the same period in different localities would be found to fade equally. The results obtained to date would seem to indicate that such is the case; and so far as the forty dyeings tested are concerned, there is a close similarity between the fading produced by this type of lamp and that of sunlight (under glass). It was decided to make further exposures with other dyeings before drawing any final conclusions, selecting colors of widely different methods of application and particularly those involving the use of metallic mordants, in order to make the test as severe as possible. These additional exposures are not yet completed.

The Mercury Vapor type of lamp was represented by the "R. U. V." and Cooper Hewitt makes. Both of these, when the dyeings were exposed to them without any intervening glass plate, gave results quite different from the sun. When, however, a Cooper Hewitt lamp was used with a glass plate in front of the dyeings,[3] thus absorbing the excess ultra-violet rays, a close similarity to sunlight was obtained, approximating that of the Violet Carbon Arc. Here also further trials are necessary before any decision can be reached, and duplicate tests must be made in two or more lamps of the same type to see if they will give the same result.

The White Flame Arc [2] used without a globe or other glass screen gave results too different from sunlight to be of service. When the dyeings were cov-

[1] Gordon: Tex. Col., Jan., 1921, p. 29.

[2] Mott: Chem. Engineer, Sept., 1915, p. 111.

[3] Flynn: Tex. World, Feb. 24, 1923, p. 25.

ered with glass, however, the results were much better, and further experiments along this line will be made.

The incandescent lamp employed in our trials gave promising results, but was altogether too slow in its fading action to be of practical use.

Your Committee are of the opinion that the Association should make no formal recommendations in this matter until the work now under way is completed. It is, however, desirable at this time to emphasize the unreliable character of exposures made with the mercury vapor lamp without a glass filter, since this type of lamp has been employed to a considerable extent in the past for fading purposes and is still occasionally used. Where the sun is the fading medium, it should be noted that if the dyeings are covered with glass some dyes fade much more slowly than without glass, while other dyes are unaffected by the glass.

Your Committee would greatly appreciate any suggestions as to modifications or extensions of the work in progress. Much remains to be done; for instance, the effect on the fading of different kinds of glass should be determined, and there are doubtless other artificial lamps which ought to be tested and recorded. To avoid unnecessary duplication of effort, it is suggested that any persons who are now engaged in work of this nature, and who desire to co-operate with this Committee, should communicate with its chairman at an early date.

President Olney—What Mr. Cady has said in regard to co-operation leads me to say a few words which perhaps may appear somewhat critical of the members of the Association and I think in our discussion it might be well to open up this whole matter at this time.

At two different times I have published in the Proceedings as a communication from the President a very earnest request that if there were any criticisms in regard to the methods which had been put forth by the various Sub-Committees that we should have a very frank and open discussion from all the members who were interested, and all members who had anything to suggest or any criticisms to offer. And at the last Annual Meeting I think that was brought out very emphatically also.

As far as I know with perhaps one or two exceptions no criticism has been made, but from time to time we get an inkling that out on the side lines somewhere there is a group of three or four men who have a decidedly critical attitude; and yet when we go to those men they have nothing to say. Surely we cannot make much headway in a constructive direction if that sort of thing is continued.

From the Proceedings I noticed that at the last New York meeting there was quite an open discussion in regard to this subject and if I am not mistaken Mr. Wood was appointed to bring the matter up at this time, and I know of no better opportunity than just now for that. We shall be pleased to hear from Mr. Wood.

P. J. Wood—While realizing the importance of the color-testing activities of the Association I think it is probably one of the driest subjects in a way that we have to deal with because of its multitudinous detail, and I rather think that is the reason that nobody has made any organized criticism of the work of the Research Committee.

In addition to that, there are so many other subjects of practical interest that I think the matter of fastness has been rather sidetracked.

At the last meeting of the New York Section we got together with the idea of going over the suggested program for this meeting so that we might be able more intelligently to co-operate in the work of this convention, and the subject on which we spent most of our time was on the matter of the future policy of the Research Committee.

It developed during discussion that there was a great deal of criticism not particularly of the tests themselves as constituted by the Committee but rather that a little more time and thought and effort had not been spent on what I will call the preliminaries; that is to say, in the choice of a standard fabric of wool, cotton and silk, to be used in all experiments not only by the Association but by all members of the Association, and if possible by all people handling textiles all over the country, for the purpose of making these tests.

It is quite conceivable that if we take, we will say, a very light worsted and make the light fastness tests and any of the other tests, and then apply the same tests to a heavy fabric like a pilot-cloth or a beaver, that we won't get uniform results. It seemed, therefore, to the New York Section that probably by co-operation with the other Associations—such as the National Association of Converters of Cotton Fabrics, the Woolen Association, the Cotton Association and the National Association of Finishers of Cotton Fabrics, which has, by the way, also a Silk Section—that we could arrive at some agreement as to the materials on which these tests should be conducted so as to make our tests all over the country uniform. That was a preliminary condition which hadn't been stipulated by the Research Committee.

Then, another very important point that had apparently been overlooked by this Committee was the standardization of the application of the various dyestuffs to these various fibers. I think that is important, because if we are going to subject these fabrics

to the action of these various agencies there should be a uniformity of their application, because we know quite well that a color applied by the mordanting method and by the after-chrome method would react quite differently and two parties might come to loggerheads by not talking about the same general condition; that is, one might be talking of a fiber that was after-treated and the other about one that was mordanted beforehand.

We think that all these things should be done preliminary to starting these tests. In other words, we should first have a little co-operation so that we can really set up these national standards not only for our Association but for the entire country.

It does seem as if the Committee has gone off a little at half-cock and started directly on the tests without entering into the proper preliminaries. That was the main criticism we had to offer, and as far as the tests themselves are concerned we also believe it might be advantageous to take into our confidence and into conference all these other Associations.

I remember a couple of years ago, when I was on the Executive Committee of the National Association of Finishers of Cotton Fabrics, that there was a meeting of the United Waist League of America, and they had all sorts of requirements, requiring fastness to perspiration, hot pressing, light and rubbing, and I believe one of the tests suggested for hot pressing was to leave a red-hot electric iron on the fabric for an hour. (Laughter.) But these people are not technical men, and I think it is our duty as the one representative association of textile chemists in this country to guide these people aright, to talk the matter over with them and make them see the light of day even if they are color-blind. (Laughter.)

We believe that before any further work is done by the Research Committee it would be advisable to consider the feasibility of getting together with these other Associations and making standard tests, not which would be acceptable to the chemists alone but which will be acceptable to the textile trades of the country as a whole. In other words, we will create a bureau of standards of textile fastness. I think this would do away with a great deal of dispute as between converter and customer, and would make the work of the Research Committee of very much more practical value. (Applause.)

President Olney—I think what Mr. Wood has said is very much to the point, and my only thought is that he should have said it about a year ago instead of now. (Laughter.)

P. J. Wood—I gave you the reason for that, Professor. Naturally, I couldn't voice my sentiments only. I am voicing the sentiments of the entire New York Section, immediately after the first meeting we had on the subject.

President Olney—I will change that then and say the New York Section should have consulted with you about a year ago. (Laughter.)

We have, I believe, the Chairmen of every one of these Sub-Committees here at the present time. I am not going to say a great deal in regard to this, because at the last Council meeting it was more or less specially requested that I take up the subject of the future research policy of the Association in my talk this evening. If I say very much about it now I will have nothing to talk about to-night. (Laughter.) But we will be pleased to hear from every one of the Chairmen of these different Sub-Committees. Mr. Livermore was the first one to report, and perhaps he is the first one we should hear from now.

W. D. Livermore—I think that before I attempt to express any opinion on these recommendations I should like to know whether they are founded on a desire to meet the view of the public outside of the manufacturers of textile goods, or whether these criticisms are supposed to apply to our tests as they interest the textile chemists themselves.

I ask this because the Committee for which I reported, reported on the matter of fulling and scouring tests on wool. Those fulling and scouring tests are principally of concern to people engaged in manufacturing woolen goods. They are not particularly interesting to the customer. I think the customer, for example, is very commonly interested to know whether his goods are going to stand reasonable exposure to light, but I don't think he cares at all whether they will stand two hours in the fulling-mill, and I felt that our report was made from the point of view of the textile chemist who was going to select colors to use in goods requiring various degrees of fulling and scouring.

I am asking that as a matter of information.

President Olney—Perhaps Mr. Wood can answer that.

P. J. Wood—It is self-evident that that is a test which applies altogether to the manufacturer of the goods. I take it for granted that everybody understands that the only thing the public is interested in is those agencies which come directly under its observation, such as light, washing, and in the case of cutters-up and manufacturers of dresses, hot pressing and perspiration.

W. D. Livermore—My answer as far as I can make it in this rather casual way would be that in selecting standards and methods for the tests for fulling and scouring, we designated in every case for those standards the methods by which the dyeing was to be done. I think there was no exception whatever to this. We

did not, however, feel obliged to go into minute details as to how the dyeing was to be done, beyond this indication of the method.

We assume that when we speak of dyeing an alizarine color upon a chrome mordant that every man in this Association knows what is meant, and we assume that when we speak of a top chroming every man in this Association knows what we mean. We do not think it is necessary to specify details for standard methods. We do think, however, that it is necessary to be quite specific as to the standards for comparison.

If we select, for example, an Alizarine Brown, as I believe we did, as a chrome color for a standard on mordanted wool we are selecting something that can be dyed on mordanted wool of any kind, anywhere, in any sort of a fabric, and when so dyed it is fast under the description given in the test. And any color which dyed comparatively against Alizarine Brown on any fabric and under any conditions which stands the fulling test equally as well as the Alizarine Brown is entitled to be rated with it.

That is our idea of the classification of those dyestuffs. I don't know whether I have covered the criticism at all, but if I haven't I will be very glad to have it brought home to me a little closer.

President Olney—In this same connection I might add that the Committee very carefully went into detail of methods and standard dyes in each case, and as I remember it, the discussion ended something like this: that if we put in all the details of dyeing, every particular fabric and every particular dye, we would have a textbook on the subject before we got through and no one would look at it. On the other hand, if we have something that is concise and condensed it will be looked at very carefully as apparently it has been by some of the speakers here to-day. We thought it was far better to give in each case a dye as a type dye—a standard—along with which any dye in question might be tested in any laboratory in a comparative way. As Mr. Livermore says, if Alizarine Brown is taken as the type and you try Alizarine Brown by your method and it doesn't work, of course, you would be reasonably sure that the method didn't check up with the one used by the committee.

That is the basis on which we proceeded, namely, that it was more important to have type dyes than perhaps standard methods of applying those dyes.

We are very glad, indeed, to have this criticism because perhaps we are all wrong. If we are, we want to be put right. As you know, all of these methods are still in a more or less provisional state and they are subject to revision at any time. Perhaps this is the time to revise some of them. So we want a free and open discussion of the whole subject.

Dr. E. H. Killheffer—I might explain what brought out the discussion in the New York Section.

It started, as I recall, something like this: I asked our various members just how many of them had actually examined the proposed tests that had already been published and found that there were perhaps as many as two in our whole Section who had really made a critical examination of them. Others had made a most superficial examination, which perhaps didn't even amount to a complete reading of the tests.

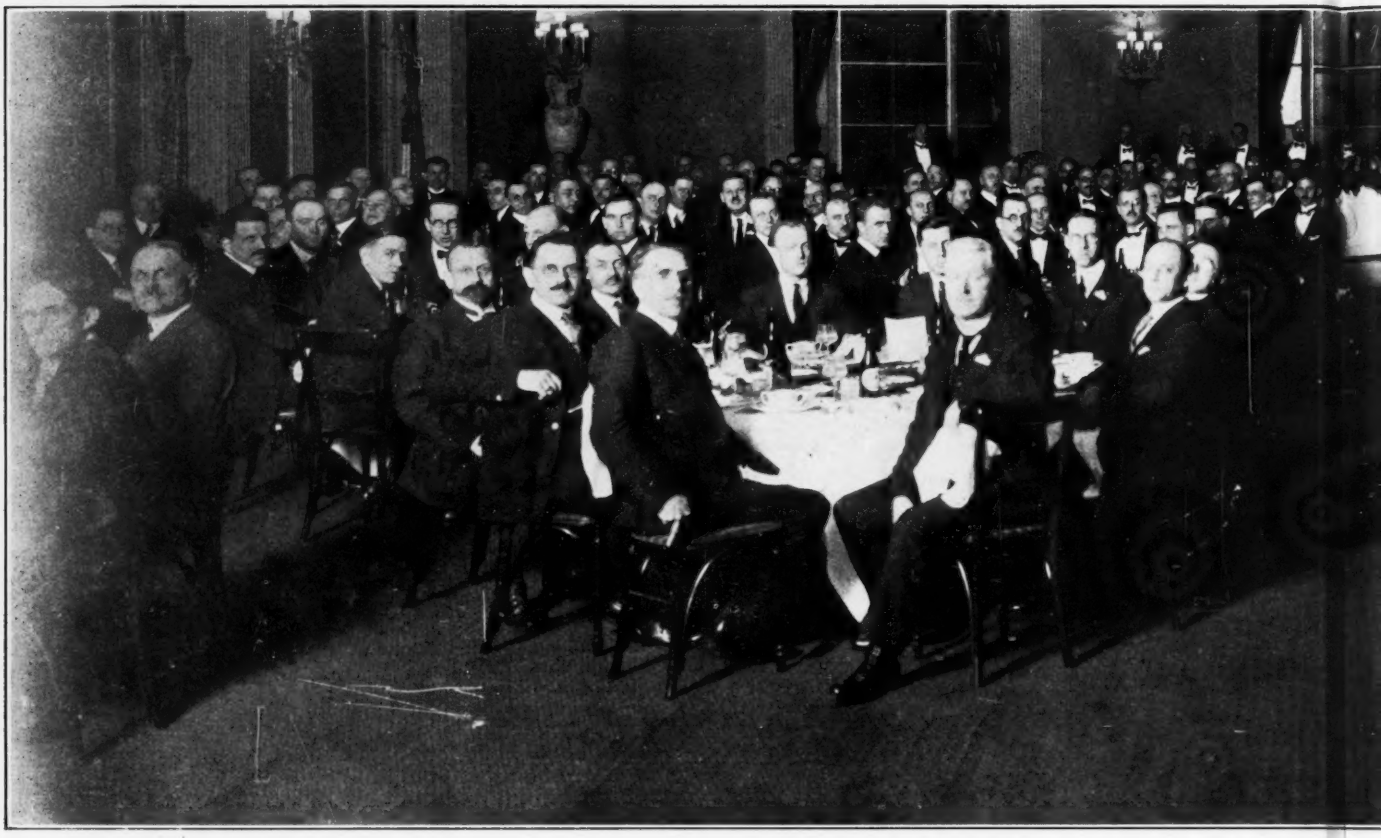
Next we tried to find out why they hadn't been examined and criticisms submitted, and, in a discussion of how to go about making these tests, as they were already submitted or would be submitted, really recognized as standard and official, the other points were brought out, as Mr. Wood has already mentioned. That is to say, if this Association, which really should be the Association to put forward standard, official tests, were to do so it would have to have some way of getting all the interested bodies to recognize those tests as official after this Association had adopted them. That would develop more or less into a selling proposition and in order to sell your article you must have it in such form as to be satisfactory to the buyer.

It is true that fulling and some tests of that sort may not be of general interest to the various Associations, but on the other hand, fastness to light, fastness to hot pressing, and things of that sort, are of intense interest to not only the various Associations but to the public everywhere. The Bureau of Standards in Washington is hopeful of putting out some official standard tests for the testing of dyed fabrics. Certainly they are not qualified to do it.

This Association is undoubtedly the best qualified to do it, and the criticism as it developed was not destructive criticism at all, but the whole thing was started with the idea of getting the members in our own Section interested so that they would really speak their minds and then come up here and repeat the process. Perhaps it was a little bit slow but I don't think that the New York Section has erred any more than the other Sections in that respect. They are awake to it now, anyway, and are willing to co-operate in any way that they can.

Professor Olney mentioned that if we prescribed methods we would have a volume that nobody would look at. I don't agree with that entirely, because if you sell a chemical or an intermediate on specification you must in your specifications state very clearly exactly how the analysis is to be made, as analyses made by different methods will give widely varying results. Surely it should not be greatly different in tests that we might put forward for the testing of dyed fabrics.

I don't believe we will do anything amiss if we try to tighten up on our tests and make them still more exact,



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and specify the fabric, the method of dyeing, not only the method of dyeing but the amount of mordant, the amount of color—and that really is the idea as already put forward by Mr. Wood.

I simply wanted to explain how the whole thing was brought out and not have you get the idea that we are a bunch of knockers down there. That isn't so. We are willing to do anything we can to co-operate. (Applause.)

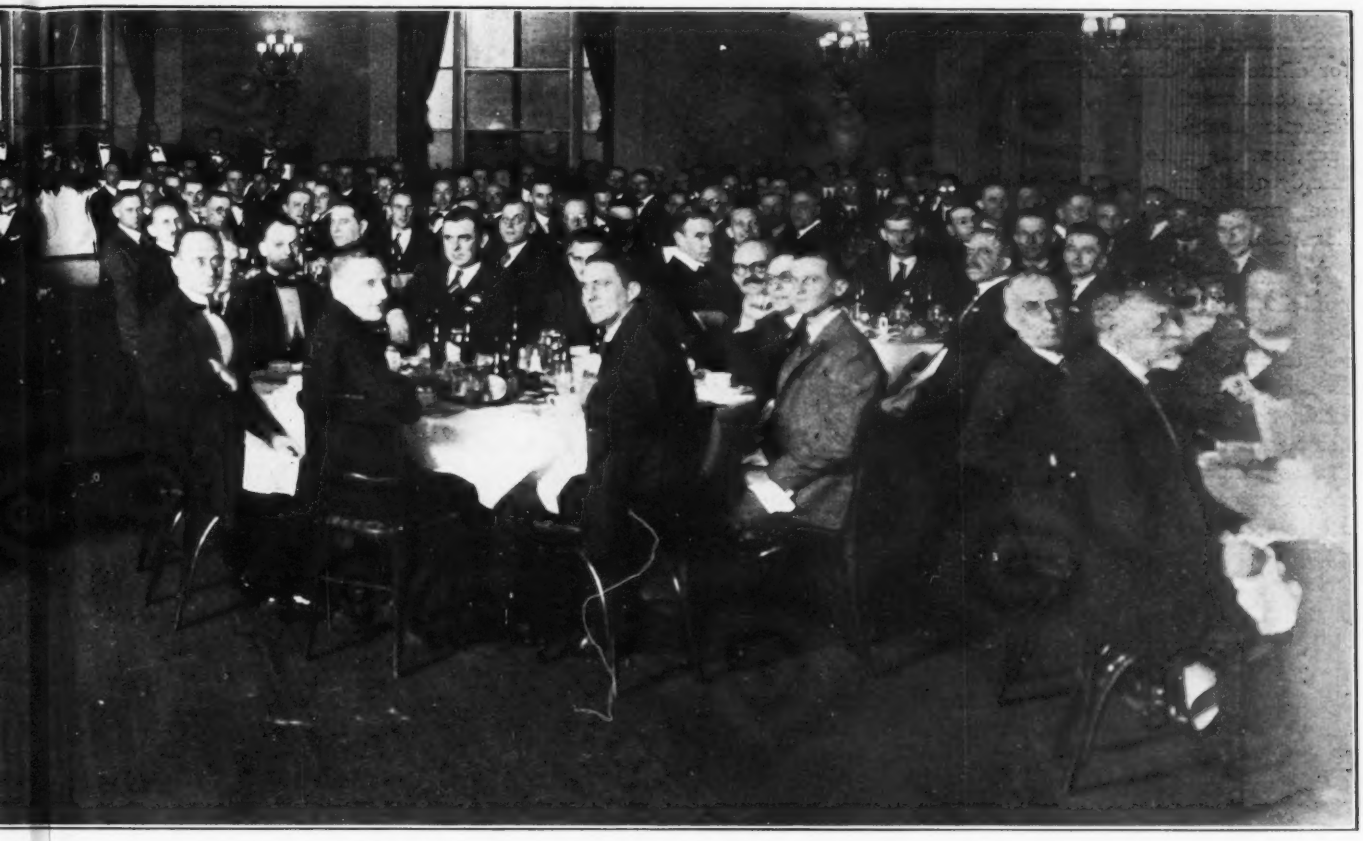
President Olney—This is just the sort of thing that the Research Committee is after. I might say that I believe up to this time our work has been more or less preliminary, and it can rightly be said that we have not reached the point, or perhaps that we are just reaching it now where we can take up these matters. That would give the impression that we were very slow in our actions, which may be so.

On the other hand, an organization that has been referred to here this afternoon took up the matter of standards, and as I remember it the Committee met down in New York and when they left the meeting, or at any rate in a few days, they had a whole list of standard tests for fastness. I think you will all agree that any set of standards drawn up in an afternoon or a week won't amount to very much.

However, as I say, we may be going at it too deliberately, but I feel that if it takes two years or three years or even five years to get this whole matter settled on a perfectly satisfactory basis all around we will have done a wonderful piece of work.

So all criticisms are in order and will be very gracefully received by the Committee. More than that, we should like to have any member or group of members appear before that Committee at any time with suggestions. We shall be much more pleased to have them do that than to stay away or even discuss the matter by themselves outside.

The time is going along rapidly and we have to hear from another Committee—the Committee on Perspiration. Mr. Christison is chairman of that Sub-Committee which will make a preliminary report at this time.



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REPORT OF SUB-COMMITTEE ON FASTNESS TO PERSPIRATION

Presented by HUGH CHRISTISON, *Sub-Committee Chairman*

With regard to perspiration, of course we felt that the first thing to do was to find out what perspiration was, and that certainly is some proposition. Mr. Claflin and others have done some work on that, but their work is admittedly incomplete. The physiological chemistries are in the same condition, and the doctors apparently don't know very much about it.

We obtained an appropriation of $50 to have some work done in some medical school, or other school, to find out what perspiration was—that is, more than we already knew—and we found that instead of taking $50 it might take $500 or $5,000 to get a little adequate work done. So that the whole thing comes back to what may be discussed this afternoon as to what the Association's future research policy will be.

There were some things on which the Committee could agree and we have embodied those in a preliminary report. First, we agreed that in order to be fast to perspiration the dyed fabric must be fast to organic acid. And in connection with organic acids, we certainly are very glad to hear that the concentrated lactic acid test has been done away with, because we cannot agree that that represents conditions. For instance, we know from years of experience that typical chrome dyestuffs have never given any trouble whatever to the consumer; in fact, we know that typical chrome dyestuffs have given perfect satisfaction, and yet most of them when soaked in concentrated lactic acid change color quite markedly and they would be ruled out by a lactic acid test.

It seems that when perspiration is first secreted, it is slightly acid, and as it is absorbed by the garment and is attacked by bacteria or fungus, that alkalinity develops. So that you will have to include also a test for alkalinity fastness.

The third conspicuous component of perspiration is

salt, and salt of itself will cause a discoloration in quite a few dyestuffs.

So that we agreed that you must have, first, a test for dilute acid, dilute alkali, and perhaps a considerable concentration of salt; also, that perspiration has an action that has nothing to do with perspiration as such, but the water in the perspiration dissolves certain dyestuffs and causes wick action. Some dyestuffs, being more soluble, will migrate toward the dry portions of the garment and cause rings.

We also are very desirous of having criticisms, and I might say that an outline of what we propose involves two solutions; they both contain salt. In the acid one we used lactic acid and a small amount of the mono-sodium phosphate. The second one we propose to make alkaline with disodium phosphate and a small amount of ammonium carbonate. And as time is a considerable element in perspiration stains, we propose to control the evaporation by testing the cloth in containers, similar to our laboratory dessicators, and to control the speed by varying strengths of sulphuric acid.

We now have samples of wool, silk and cotton that are about ready to distribute and we are trying to work out a convenient form of making these tests. We thought at first we would roll the goods, but rolling has not given quite the results we would like and we are trying various things, such as placing them on glass or between glass or between pieces of felt, as some have suggested. And as soon as we do some more preliminary work the samples will be sent around to various members of the Committee and others who care to co-operate with us. (Applause.)

President Olney—We have five minutes more before we adjourn. Our meeting this afternoon will be called promptly at two o'clock and we wish to allow at least an hour and a quarter for lunch so that we will all be back here on time. But we have five minutes more and we would like to hear further discussion if you have any in regard to what Mr. Christison has said concerning perspiration.

A. L. Lustig—Mr. Chairman, in order to bring out the feeling of the Association regarding the programs of these Committees it might be in order to take a vote to see whether it is the consensus of opinion that it would be advantageous to this Association if these Committees might co-operate with other committees throughout the country who are doing work of this sort.

President Olney—That is perfectly in order. Mr. Lustig wishes a discussion as to the advisability of taking a vote at this meeting in regard to co-operation with other associations. Of course, that is rather broad in a way, because we don't know offhand just the associations that we could best co-operate with, but there are very many that we could.

Is there any discussion in regard to that?

W. C. Durfee—Mr. Chairman, I think it is perfectly obvious that we should co-operate with the committees of the various textile associations, converters' associations, and all classes of people, but the time has not come in my opinion when we can do that.

I am not a member of any of these Committees, but as an ex-officio member and Treasurer of the organization, I have the privilege and pleasure of listening in on their discussions and I am aware of the enormous amount of work that has been done by the members of the various Research Committees. I also know something about the viewpoints of the converters and the cutters and people of that type.

I think if we go into co-operation with the cutters, converters, dry goods people, and people of that kind at the present moment we will be unprepared to intelligently co-operate. The foundation work that these Committees are doing is really very vast, and it is not simple.

There was a time not long since when if you wanted to build a house you hired an ordinary man and he went to work and dug a cellar, laid the stone around it and called in the carpenters and the builders, and they built a very respectable house on that idea. But now if you want to build a building in the city that is worth anything, you have to hire a foundation company; they dig down about 200 feet in the ground and make three or four cellars and build the thing four or five stories underground before they start.

That is the way the duties of these Committees are to-day that are working for our Association, and I think as Professor Olney has said it is going to take a very large amount of time to search out the permissible facts that can be obtained and the foundation ideas, and the measurements, etc., before we can really intelligently come to these other Associations and say to them, "We are prepared to co-operate." I do not think that this Association has been in existence long enough or that these very able Committees have served sufficiently long as yet to come to the point where they can go to outside Associations and say, "How will we compare notes and how will be operate?"

I think it is essential that that should be done, but I hardly think the time has come for us to do it.

Dr. W. M. Scott—Mr. President, as Chairman of the Sub-Committee on Fastness to Washing of Dyed Silks, I agree with Mr. Durfee that the time isn't quite ripe for us to co-operate with other Associations, especially in view of the discussion that we have had here previously.

I think the first thing this Association should do is to

continue this frank and free discussion of our proposed tests and standards, and settle the thing among ourselves, so that we will stand united, so to speak, when we begin to go to other Associations with our methods. That is, I think what we want at present is, you might say, more specific criticism of the methods as they stand and then we should unanimously adopt these methods in our Association before we start to ask for the co-operation of other Associations in promoting those methods as standards.

We have heard criticisms concerning these methods. I haven't time now to analyze that, but the Committee originally considered—speaking particularly for my Committee—that we had been sufficiently specific in naming the standards and the method of dyeing. That is, in every case if it was a chrome color on silk we specified whether it was to be after-chromed; if it was a developed color, how it was to be developed; and if it was a basic color, to be dyed with acetic acid, and so on.

If we have not gone far enough along that line to satisfy the members we would like to hear you say so, and we would like to get specific instructions or suggestions as to how to proceed further. I believe we should work along that line of agreement among ourselves and also as to the matter of whether we should specify a standard fabric or not before we go to another or other Associations.

Dr. E. H. Killheffer—Professor Olney, my view personally differs a little bit in the matter of co-operation. I don't think that we should offer our co-operation particularly to other Associations, but I do think that we should invite them to co-operate with us. We have a proposition to settle. This is the body that should settle on standard tests. This body is best qualified to settle on such tests.

When these other Associations, like the United Waist League (which has been mentioned here), try to arrive at some tests they usually do it on the suggestion of one or two men who sit in at their meetings and who know or think they know what the requirements should be.

But if we go to some of those Associations and invite them to co-operate with us, particularly the Government Bureau if you please, and let them send representatives to sit with our Research Committee they will then feel as though they at least assisted in arriving at our conclusions, once we arrive at them, and we won't find nearly as great difficulty then in having tests recognized as standard and official over the whole country—which I believe is the end that is sought for. (Applause.)

President Olney—Have you anything further to say in regard to that, Mr. Lustig? I think your suggestion has brought out some very valuable points and we are glad that you made it. We will surely act accordingly.

A. L. Lustig—I made that suggestion in the form of a motion.

President Olney—Did you? Mr. Lustig says he made that as a motion. Has it been seconded?

. . . The motion was seconded. . . .

A. A. Claflin—Mr. Chairman, if it is put in the form of a motion, even at the risk of keeping us here a minute or two longer, as a member of one of the Committees I would like to say something, and that is: I don't think the Committee on Perspiration, for example, is really ready yet for general co-operation. In mathematics it frequently is necessary to assume a value when you start to solve a problem. So in our work on the Committee on Perspiration, in order to get anywhere at all it seems to me it is first necessary to, you might say, guess at as good a test for perspiration as could be arrived at. When we first took up this matter of perspiration we saw that all the tests that had been suggested didn't have any relation to perspiration, so we have simply guessed at certain methods which we think will bring results.

It may be that we will want to change them entirely before we submit them to outside criticism. But if we have to have outside co-operation, presumably from men who know less but are more critical than we are ourselves, we will postpone getting anything definite, and in fact won't get anywhere at all. On the other hand, if we can devise a method and send it around to our friends, then by consultation with everybody we can get a method that will be ready for joint criticism.

So I hope that we can postpone our invitation for co-operation.

Giles Low—Mr. Chairman, it seems to me that that matter of co-operation would resolve itself into two different sections. In the first place, they would tell us something; and then latterly we would tell them something. For instance, in connection with the Committee on Perspiration there are certain Associations who require such tests on the material that they manufacture; and there would be perhaps another association where the requirements would not be the same. It seems, therefore, the first part of the co-operation proposition would be for them to tell us what was expected of goods in their trade.

As for washing, every single organization must have an entirely different idea of it, and in order to get our one single washing fastness it would be necessary to get a lot of different viewpoints to come to an average on it.

President Olney—We have a motion before us—

P. J. Wood—Mr. President, I move that the question be left over till this afternoon as it is a serious matter, and the meeting is a little bit disorganized at this late hour.

. . . The motion was regularly seconded. . . .

President Olney—The motion is made and seconded that this matter be left over until this afternoon; those in favor say "aye," opposed "no." It is carried unanimously.

. . . The meeting adjourned at one o'clock.

Saturday Afternoon Session

December 8, 1923

The meeting convened at 2,15, President Louis A. Olney presiding.

President Olney—We will continue our business meeting. The business meeting really began this morning, the latter part of the session. We will first hear the reports of the Secretary and the Treasurer. I suppose if we were proceeding in the proper form our election of officers would follow these reports, but as it will take so long to go through these ballots and count them I am going to appoint three tellers now: Mr. Williams, Mr. Low and Dr. Hollander, and they may report later. These are the ballots which have been sent to the Secretary, and I believe you will find them enclosed in envelopes on the inside. If the gentlemen mentioned will proceed to act as tellers we shall be very much pleased.

We will now have the report of the Secretary.

. . . Secretary Hadley presented his report for the year ending December 8, 1923, as follows:

SECRETARY'S REPORT FOR YEAR ENDING DECEMBER 8, 1923

During the year ending December 8th, 1923, the Association has admitted to membership five Corporate Members, 97 Active Members, 69 Junior Members.

Two Active members have withdrawn during the past year, and the membership at the present time is as follows: Five Corporate Members, 451 Active Members, 111 Junior Members, with a total of 567 members.

The Council has held eight meetings in Boston, and the Research Committee has held six meetings.

We have four well organized Local Sections designated as Northern New England, Rhode Island, New York and Philadelphia, respectively, all of which have held numerous meetings throughout the last year. We have also a Local Junior Section at the Lowell Textile School.

The Association has published and distributed to each member a Year Book covering the activities of the Association. The advertisements appearing therein more than covered the cost of publishing.

Respectfully submitted,

WALTER E. HADLEY, Secretary.

President Olney—You have heard this report; what is your pleasure in regard to it?

Dr. L. A. Pratt—I move it be accepted.

. . . The motion was regularly seconded and carried.

President Olney—We will now have the Treasurer's report. Mr. Durfee.

TREASURER'S REPORT

W. C. Durfee—The receipts during the past year have been:

From dues	$2,470.00
From corporate memberships	100.00
Profits from the Year Book (advertising principally)	193.00
Refund from Howes Publishing Co.	1.50
New York Meeting	49.39
Journals	5.00
Exchange on Canadian funds	.25
Total	$2,819.14

The expenses are divided into Administration—that is, Secretary and mostly stationery, postage and printing—money given to the Sections and to the Secretary's office for special purposes, and money paid for the journal. The expenses were:

Administration	$ 614.45
Sections	275.00
Journal	1,321.24
Total	$2,210.69

That made a balance of $608.45. We had a little balance left over from the previous year amounting to $516.07, so that our total balance on hand on November 19, 1923, was $1,124.52.

Just in passing I will say that the dues we have recently billed out have been paid promptly, and we have paid equally as promptly the primary bills for the year, so the Treasurer now has a good balance on hand for the present year. We are very much pleased with the promptness with which membership dues have been paid, not so much on account of the treasury receiving the funds, but because of the spirit of intense interest in the Association which that promptness typifies.

President Olney—You have heard the report of the Treasurer; what action shall we take in regard to that?

. . . It was voted upon motion regularly made and seconded that the Treasurer's report be placed on file as read.

President Olney—Our next business is in regard to the proposed amendments which have been printed on the back of the program. If you have not read them already, I will say just a few words in regard to them in the way of explanation.

The Constitution and By-Laws of the Association made no provision for junior sections. Most other associations of a similar character have such a provision and junior sections are officially recognized by them.

A group of students in the Lowell Textile School about

a year ago indicated their desire to become a junior section of this Association, but we could not at that time officially admit them under that heading. The Council, however, took temporary action and devised a working plan whereby they could organize and continue their work as a subdivision of the Northern New England Section. It was thought by a number of members of the Association, and it was particularly desired on the part of these junior members, that they should be officially recognized and these proposed amendments as printed are for that purpose. Perhaps I had better read these before we vote upon them.

These amendments have been proposed to the Constitution, same having been presented in writing to the Secretary for presentation to the Council, at least four weeks prior to the Annual Meeting, such procedure being in accordance with the Constitution.

. . . President Olney then read the Proposed Amendments to the Constitution as follows:

Suggested Amendment to Provide for Local Junior Sections

I. Whenever fifteen or more Junior Members desire to form a Local Junior Section in connection with a Textile School or similar Educational Institution, the Council may upon written application of such members authorize the formation of such a section.

II. Local Junior Sections shall elect each year a Chairman, Secretary and Treasurer and such other officers as may be deemed necessary, and may adopt such by-laws as may be best suited to their individual needs, but in each case a copy of such by-laws or any amendment must be forwarded to the Secretary of the Association and be subject to approval by the Council.

III. The Treasurer of each Junior Section may draw upon the Treasurer of the Association once a year for the purpose of defraying expenses of the section for an amount not exceeding one dollar per member.

IV. The Secretary of such a Junior Section must send a report to the Secretary of the Association of every meeting within two weeks after such a meeting is held.

V. If it shall appear to the Council that any Junior Section is not being carried on in a manner creditable to the Association the Council may dissolve such Junior Section.

President Olney—These amendments have been signed by Wm. D. Livermore, Alex. Morrison, Leslie Chritison, Geo. A. Moran, Helen L. Arey, Carl Toepler, John M. Hood, Pasquale P. DeNuccio, Wm. Woosnam, A. MacMillan—all of whom are active members of the Association.

Is there any discussion in regard to these amendments or any questions?

E. V. Steele—May I say just a word in regard to our Section?

We have approximately 25 chemistry students at the Lowell Textile School who have made application this year for membership. Just as an indication of our interest in the Society, ten members of our Section are here to-day. They comprise, with one exception, all the men who will take their degrees from the Lowell Textile School this June. (Applause.)

President Olney—From that statement you will see the advisability of a junior section because if for no other reason it will result in training the younger men in the ways of the Association, and what we need in future years is new blood—younger men—to carry the Association along.

If there are no further remarks, we will vote on these amendments, and unless there is objection we will vote on all five at once in order to expedite matters. Hearing no objection, we will proceed to vote on the five. All those in favor of accepting these amendments as they have been read will please say "aye," contrary-minded "no." It appears to be a unanimous vote.

The tellers apparently are not ready to report on the elections as yet so I think the next business is a continuation of our discussion of this morning in regard to the motion that was made by Mr. Lustig. Will you repeat that motion?

A. L. Lustig—Mr. Chairman, I don't know that I can state it in the exact words, but what I had in mind was that we should put it to a vote as to whether the Research Commitee should be instructed by the Society to get in touch with outside organizations that may be working along the same lines, in order to get their ideas and perhaps produce results leading to more practical solutions of the problems under investigation. I don't know that those are the exact words, but that is the meaning.

President Olney—I think this is a rather important matter and consequently I am going to ask Mr. Lustig, Mr. Livermore and Mr. Wood to take a few minutes and put the motion into rather specific form. So we will postpone that matter for the moment and take it up again a little later.

Is there any other business to come before the Association? This is the time for new business as well as unfinished business. Has any member anything to present in the way of new or unfinished business?

As there does not appear to be anything to present we will proceed with our program, subject to a continuation of our business meeting a little later.

I understand the one who is to present the first paper prefers to have that postponed for a short while. Is that so?

Dr. E. H. Killheffer—Yes, they are not here as yet, Professor.

President Olney—We will proceed then to the second number on the program, "Vat Dyes: Their Properties and Various Phases of Their Application." The discussion is to be led by G. K. Hannah, Jr. Mr. Hannah. (Applause.)

VAT DYES: THEIR PROPERTIES AND VARIOUS PHASES OF APPLICATION

By GEORGE K. HANNAH, JR.
Of E. I. du Pont de Nemours & Co., Inc.

Mr. President, Fellow Members and Visitors: I might say that I noticed coming down on the train last night that there had been a discussion in the New York Section of vat dyes and their application on different machines and different fibers. Not wishing to repeat anything that had been said at that meeting, I felt it would be better for me perhaps not to attend the meeting this morning but to rewrite my paper, confining my remarks to the cotton fiber, and present the subject from a different aspect.

The art of dyeing is one of the most ancient of the arts, and was developed by the ancient craftsman, by trial and error. He found some materials served his purpose and that others did not, as some would impart colors which rapidly faded or could be washed away, while others gave colors which withstood all the actions of the weather to which they were subjected. The colors he found most suitable were those belonging to the vat series. For instance, Indigo and Tyrian Purple, or present-day Dibrome-indigo, sold as Helindone Blue 2B by the Germans and Midland Blue R by the Americans. Indigo, the most important and valuable coloring matter the world has known, was, up to the year 1901, the only representative of the vat series of coloring matters of commercial importance. The determination of the chemical constitution of Indigo revealed the structure on which the property of vat dyeing was based, and led to the preparation of synthetic Indigo and the new type of compounds which we call "vat dyestuffs." The production of these new types of compounds from Anthraquinone placed the vat dyes at the head of the synthetic colors, and at the present time they are among the fastest and most brilliant and valuable of all colors.

Vat dyestuffs, being insoluble in water, cannot be used directly for dyeing, but by treating with reducing agents, however, one or more of the carbonyl groups present combine on reduction with one or more atoms of hydrogen to make a "leuco" compound (or combining form of the dyestuff), which reacts like a weak acid, whose alkali salts are soluble in water.

These alkaline solutions of the reduced compounds possess great affinity for the fiber and are rapidly reoxidized on treatment with air or chemical reagents, with the resultant precipitation of the ordinary dyestuff on the fiber, producing colors which are among the fastest known.

The dyeing of vat dyestuffs is not dyeing in the same sense that dyeing wool with acid dyestuffs is dyeing, as there is no chemical combination of the dyestuff with the fiber but a deposition of the pigment dyestuff on the fiber.

Since 1901, when Indanthrene was put on the market, a large number of vat dyes have been produced commercially, which may be divided into three distinct chemical classes, as follows: Anthracene Dyestuffs; Indigoid Dyestuffs; Carbazol or Sulphur Vat Dyestuffs.

Anthracene dyestuffs include Algol, Anthra, Anthrene, Caledone, Chloranthrene, Cibanone, Duranthrene, Hydranthrene, Indanthrene, Leucole, Ponsol, and some of the newer Hydron colors.

Indigoid dyestuffs include Alizarine-indigo, Ciba, Durindone, Helindone, Thio-indigo, and some of the newer Hydron colors.

Carbazol dyestuffs include Carbindole, Dynon, Hydron and Sulfanthrene colors. Two products, the Hydron Blues G and R, are in a class distinct from any of the rest of the blues in the three chemical classes or series, in that they are the only products which will produce a Navy Blue at a reasonable cost.

The application of the vat dyestuffs has been a source of great trouble to the dyer, and has presented many difficulties; but experience has been gradually gained which has enabled him to overcome most of his difficulties and produce perfect results. The greatest difficulties have been encountered when dyeing compound shades, and the dyer has had to judge from practical experience the types which were most suitable for each individual case.

When combining two or more colors, which should be preferably of the same chemical class or series, they are reduced separately at their proper temperatures, and after mixing the separate solutions well in a tub they are fed to the dye vat and dyed at their average temperature. The dye vat must be maintained in a clear solution, as the presence of cloudiness or sediment indicates unreduced dyestuff, which condition must be corrected by the addition of hydrosulphite and caustic soda. Under-reduction of a dye vat gives resulting flecky and mottled dyeings which are not fast, and an over-reduced dye vat gives dull shades with poor exhaustion of the dye vat.

Fastness Qualities of Vat Dyestuffs

The vat dyestuffs have acquired an excellent reputation for fastness, which is undeserved in many cases, since there are degrees of fastness among this class, just as there are in every class of dyestuffs. Some vat dyestuffs are fugitive to light and poor to washing and steeping in cold water, so that preliminary tests should always be made before adopting them on a commercial scale. However, certain members are of extraordinary fastness to light, boiling soap, washing and chlorine. Selected dyestuffs in this class are the colors which are used in the guaranteed cloths, such as window draperies, blouse and shirt fabrics, handkerchief cloth and embroidery yarns, which the makers sell under guarantee of replacement if the color fades or bleeds.

On cotton it may be said, in general, that the Anthracene group of vat dyestuffs are the fastest, followed by the Carbazol group, while the Indigoid group are the least fast. On the contrary, the Indigoid group and Carbazol group do not present the same difficulties in their application as do the Anthracene group.

Composition of the Dye Vat or Dye Bath

The three main factors which regulate the resulting dyeings with the vat dyestuffs are, first, the requisite alkalinity of the bath; second, the best temperature to use for reduction and for dyeing; third, the requisite amount of hydrosulphite.

The correct amount of alkali to use in the dye bath plays a most important part in obtaining good results. If too little alkali is present the leuco compound is not in the proper state of solution, so that the full value will not be obtained from the dyestuff; whereas, if too much alkali is used the leuco compound is present in the dye bath in too soluble a form and the fiber cannot withdraw the maximum amount of dyestuff from the bath. In practice, the amount of alkali is usually calculated on the volume of the liquor and on the amount of dyestuff.

The Anthracene group of dyestuffs require practically the same amount of caustic soda, regardless of the depth of shade being dyed; but the Indigoid and Carbazol groups generally require the alkali to be varied according to the percentage of dyestuff to be used.

Temperature of the Dye Bath

The temperature at which the dyeing is made has a definite influence on the fastness of some dyestuffs, as many of them are not so fast to washing and to chlorine if they are reduced and dyed at too high a temperature. Some vat dyestuffs fall out of solution if the temperature of the dye bath is allowed to drop. Some may be brought back into solution again by reheating the vat. Others cannot be brought back into solution once they have fallen out.

Procedure of Reduction

The general procedure for reduction of a vat dyestuff is, if in paste form, to mix it with previously dissolved caustic soda, which is used to dissolve and to retain in solution the leuco body obtained. Then water of the proper temperature is poured onto the mixture and the hydrosulphite gradually sifted in. After a thorough stirring, followed by a short standing, the dyestuff will become reduced and, if the vat is not too concentrated, will have gone into complete solution, showing its characteristic color. Where powdered dyestuffs are used they are treated in the same way, after having been pasted with a little denatured alcohol or soluble oil, using, of course, proportionately more caustic soda and hydrosulphite. The dye vat, previous to the addition of reduced dyestuff, should be prepared with water of the proper temperature which has been deoxygenated by the addition of a little alkali and hydrosulphite, together with any necessary retarding agent, to insure good dyeings.

The proportion of hydrosulphite to dyestuff varies with the three groups or series. Before starting the dyeing, the bath should be carefully examined to see that the dyestuff is in complete solution, and should also be examined at intervals during the dyeing to see whether the dyestuff falls out of solution as the dyeing proceeds. It may happen that the dyestuff will be in perfect solution when starting the dyeing, but if the amount of hydrosulphite is on the under side the dyestuff will gradually fall out of solution, so that at the end of the dyeing none will be in solution.

The Anthracene group require a much more alkaline bath than the Indigoid and Carbazol groups, but they also require relatively much less hydrosulphite than these two groups. The difference in these between the Indigoid and Carbazol groups is much less pronounced.

Methods of Application

Experience has shown that a general statement of the chemicals to be employed can be formulated, but it is impossible to give a definite formula of proportions of these chemicals which would apply in every case. This is caused by the varying solubilities, of different rates of exhaustion, and sensitiveness to reducing agents, varying temperatures and many other

conditions which are not uniform with all the vat colors. Each dyestuff must be considered separately, and its proper method of application depends on the particular properties of the dyestuff and not upon methods which are satisfactory with other dyes.

The basis of dyeing of the vat dyestuffs consists in the fact that while they are insoluble in the ordinary solvents in their marketable condition, their reduction products are soluble and have dyeing properties, and that the reduced bodies thus dyed upon the fiber may be oxidized into coloring matters of great stability and fastness.

The problem of the proper dye vat is, therefore, much more difficult than that of the older cotton dyes, in which the conditions of reduction and oxidation did not enter.

Hydrosulphite of soda has been found to be the best reducing agent, on account of its solubility, non-formation of insoluble lime or other salts, its uniform action and the completeness of reduction of the dyestuff when subjected to its action. The universal reducing agent —hydrosulphite—is therefore generally used, and formulæ for dyeing the various dyestuffs differ only in the quantity employed, strength of the dye vat and the time and temperature employed.

Methods of Oxidation

Thorough oxidation is necessary to transform the soluble leuco dyestuff into the insoluble coloring matter. If the material is rinsed before oxidation has taken place, and without the hydrosulphite adhering to the material being decomposed, and the alkali neutralized, part of the soluble dyestuff is stripped and uneven shades result. The dyestuff oxidizes rapidly without further manipulation where air has free access to the fiber, such as with yarn in the hank which has been evenly wrung and open warps dyed in the Scotch tub and piece goods dyed on the padder and continuous machine. Hanks or skeins which cannot be wrung after dyeing are immediately immersed in an acid bath. Cops, packages, beamed warps and batched piece goods must be oxidized by suitable manipulation prior to rinsing. A number of the cop, package and beam dyeing machines are fitted with arrangements to allow air to be sucked or blown through the material; where this is not practicable, the material is either rinsed with acidified water or solutions of sodium perborate or sodium peroxide.

For dyestuffs, like Indanthrene Yellow G, which oxidize slowly it is advisable to work in a bath of sodium perborate; bichromate of soda or potash in acid solution or peroxide may be used, but perborate is to be preferred, being the most convenient; whereas with bichrome there is a danger in some cases of overoxidation, with consequent dulling of the shade and resultant dyeings which are not so fast to crocking, scouring and chlorine.

Methods of Development

Oxidation of the dyestuff is not sufficient for full development of shade and fastness properties, and a thorough development must take place after oxidation. This is accomplished by a treatment with either a soap or a soda ash solution, or both soap and soda ash.

The fastness to soaping of the vat dyestuffs varies considerably, so that the severity of this operation must be regulated to each individual dyestuff; and it must be remembered that soaping is essential to the complete development of the shade in most instances.

Instead of using soap for developing the dyestuff on raw stock, soda ash is generally substituted.

Shades developed in boiling soap or soda ash are generally brighter and faster than those treated only with an oxidizing bath of bichromate and acid.

Some dyestuffs are developed to exceptionally bright shades by a treatment of a cold chloride of lime solution at ¾ to 1 deg. Tw., then washed and anti-chlored.

In some cases a treatment with steam underpressure develops the shade to best advantage.

Dyeing of Cotton With Vat Dyestuffs

In considering the vat dyestuffs as applied to cotton, the following processes will bear description: Hank or skein dyeing; raw stock, cop, package and beam warp dyeing; chain warp dyeing and piece goods dyeing.

In all these processes the dyestuffs are brought into solution by reduction, which can be effected in the various ways used for Indigo. For instance, one may use any of the following reducing agents separately and in many cases in combination: Sodium hydrosulphite, zinc and sodium bisulphite, copperas and lime, copperas and tin crystals, zinc and lime, and in some cases sodium sulphide, and also glucose, with the necessary caustic soda or soda ash to maintain the alkalinity of the dye bath. But, with the readily obtained, convenient and excellent reducing agent—sodium hydrosulphite—which is put on the market in a very stable powder form, the reduction of all the various vat dyestuffs is accomplished so simply and quickly that it is the reducing agent of chief importance and the one generally recommended.

In working the method with hydrosulphite, the dyestuff, if in paste form, is simply mixed with the previously dissolved caustic soda, which is used to dissolve and to retain in solution the leuco body obtained.

then water of the proper temperature is poured over the mixture, which is well stirred, while the hydrosulphite is slowly sifted in.

When using the powdered forms of vat dyestuffs they are moistened and stirred into a smooth paste with a little denatured alcohol or soluble oil, or both; then they are treated in the same way as the paste products, using, of course, proportionately more caustic soda and hydrosulphite.

After a thorough stirring, followed by a short standing, the dyestuff will have become reduced, and if the liquor is not too concentrated will have gone into complete solution, showing its characteristic color.

Generally the preparation of a stock vat is recommended from which is taken sufficient to obtain the shade to be dyed. This is added to the dye vat, which, to insure good dyeings, should be prepared with water, deoxygenated by the addition of a little caustic soda and hydrosulphite, together with any leveling or retarding agents necessary.

In the dyeing of the vat dyestuffs care should be taken not to get the dye bath too alkaline, as in this condition the color is less easily absorbed by the fiber and the resultant shades are, of course, too thin.

Care must also be taken that the dye bath is not made acid with an excess of hydrosulphite, as in this condition the bath becomes turbid and the resultant shade is uneven, while the dyestuff is precipitated in the bath.

With some dyestuffs a small addition of common salt, or Glauber salt, can be made to the dye bath, thus effecting a more complete exhaustion of the dyestuff. Again, when dyeings are almost completed, to obtain a more complete exhaustion of the dye bath small additions of dilute acids can be made to the bath. Care must be observed in both cases, as an excess of either salt or acid is liable to salt the dyestuff onto the fiber too readily and the dyeings will not be as even, or so fast to rubbing and washing as they ought to be.

Methods of Dyeing Cotton—Hank or Skein Dyeing

Cotton yarn in the hank is dyed in an ordinary tub, for one-half to three-quarters of an hour, either on bent rods under the surface, or on straight sticks above the surface of the liquor. When dyed on straight sticks a slight excess of both caustic soda and hydrosulphite should be used in the dye bath. The yarn is entered wet and worked continually throughout the dyeing operation, and after lifting, the yarn is well wrung, and allowed to oxidize in the air. Hanks which cannot be wrung after dyeing are immediately immersed in an acid bath to neutralize the caustic soda, and completely oxidize the dyestuff on the fiber. The hanks are well washed in either case with cold and warm waters, then developed in a soap bath at the proper temperature, rinsed and dried.

Chain Warp Dyeing

The dyeing of cotton chain warps is usually conducted in a so-called Scotch dyeing machine, the warps having been previously boiled out and encircled with a binding cord, then doubled to the proper thickness (3½ to 4 inches in circumference) to obtain an even squeeze in the rolls of the dyeing machine. These rolls should be even and level, and should be covered with at least 1½ inches of good live rubber, and should be well weighted.

In chain warp dyeing the bath should contain quite an excess of caustic soda and hydrosulphite to keep the vat in condition, and thus allow for the constant oxidation due to the splash from the squeeze rolls and the air which the warps carry with them. This excess, which should be just enough to carry the dyestuff in solution over the total number of predetermined ends or runs of the warps in the machine, is easily determined by the appearance of the dye bath, and the unoxidized leuco-body in the liquor as seen on the yarn entering the squeeze rolls.

If the condition of the dye bath is good—that is, if it is neither too alkaline nor contains too much hydrosulphite—the warps retain the color of the leuco compound as they leave the dye bath and enter the squeeze rolls, and they are not completely oxidized by the air until they are folded into the yarn truck. If the condition of the dye bath is not good, while the stock vat being fed on is in perfect state of reduction, the yarn entering the squeeze rolls will not be the color of the leuco compound of the dyestuff, and the dyer must make additions of either or both caustic soda and hydrosulphite to the dye bath to bring the vat liquor into solution; otherwise, the shade will be mottled and of very poor fastness to crocking and washing, if any shade is obtained at all.

Generally the warps are perfectly oxidized as they fall into the truck, but if the dyer prefers he may be assured of best results by passing the warps several times through an acid-oxidizing bath, after which the yarn should be well rinsed with cold and warm running waters, developed with soap, or soap and soda at the proper temperature, then finally washed and dried.

Raw Stock, Cop, Package and Beam Dyeing

Since in dyeing with the vat dyestuffs there is no chemical combination of the dyestuff with the fiber, but a deposition of a pigment dyestuff on the fiber, it is very essential in machine dyeing, where the dye liquor is pumped through the material, to dye at a reduced pressure; otherwise the dye will be deposited unevenly on the material owing to the fact that where the material

is the most compact, there will be but little deposition of the dyestuff, and where more loosely packed a greater deposition of the dyestuff.

To counteract this difficulty, wherever the pressure of the pump cannot be reduced by varying the speed of same, a reducing valve is often used, so that a predetermined maximum pressure is maintained on the material being dyed. Another method of overcoming this difficulty when the speed of the pump is constant, is to partially short-circuit the liquor, leaving the pump, so that only a small part passes through the material being dyed, the rest being by-passed back to the suction side of the pump without having passed through the material. This reduction of pressure is especially desired when applying vat dyestuffs of the Anthracene series to raw-stock, cops, packages and beams under pressure. In general, the lower the pressure within certain limits, the more perfect the resulting dyeings.

To prevent bad dyeings, it is often advisable to boil out the material with a small percentage of animal glue and soda ash, and then circulate through the material a blank bath containing an alkali and hydrosulphite, and some cases require glue or a soluble oil, and then to add the reduced dyestuff to this blank bath.

After dyeing has proceeded for one-half to three-quarters of an hour, the dye bath can be exhausted by the slow addition of a salt or acid solution, as previously mentioned. The liquor is then drawn off by vacuum or pressure in which case the leuco-compound is oxidized on the fiber, or it can be oxidized by chemicals, such as sodium perborate, sodium peroxide, and solutions of acid, either with or without the addition of bichromate of soda or potash.

After oxidizing and developing the shade on raw stock it is advisable to finish with a softening agent and a hygroscopic substance to facilitate carding and spinning operations.

NOTE.—The discussion of Mr. Hannah's paper will appear in the next issue.

APPLICANTS FOR MEMBERSHIP

The following is a list of names of those who are making application for membership in the Association:

Active Membership

Barney, H. C., bleacher, United States Finishing Company, Providence, R. I. Sponsors: L. L. Bamberger and T. Turner.

Clough, William B., textile colorist, Oriental Silk Printing Company, Haledon, N. J. Sponsors: P. J. Wood and S. F. Carter.

Dengler, C. E., chief chemist, United Piece Dye Works, Lodi, N. J. Sponsors: E. H. Killheffer and Giles Low.

Fiebiger, J. H., chemist and salesman, H. A. Metz & Co., Philadelphia, Pa. Sponsors: E. C. Bertolet and P. Theel.

Franke, K. W., chemist and dyer, Roxboro Cotton Mills, Roxboro, N. C. Sponsors: R. F. Culver and W. E. Hadley.

Froelich, H. F., chemist and textile printer, New Art Textile Print Works, New York, N. Y. Sponsors: D. P. Knowland and J. S. Lange.

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AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

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THE CHEMICAL FOUNDATION DECISION

THE sweeping victory for the defendant—the Chemical Foundation, Inc.—in the case of the Government's suit to recover German dye and other chemical patents sold to the defendant by the Alien Property Custodian is most gratifying to the dyestuff industry and to all elements which have striven to establish American chemical independence.

The decision, as rendered by Judge Hugh M. Morris, Jr., in the United States District Court for Delaware, denies to the plaintiff—the Government—the specific relief sought; namely, the invalidation of the patents' sale and their return to the plaintiff. Further than this, however, Judge Morris analyzes each separate allegation made in the Government's bill of complaint and finds not one single charge to be sustained by the evidence submitted or by the law involved.

Referring to the Government's contention that in selling the patents at private sale and at a price admitted to be less than their intrinsic value, the Alien Property Custodian exceeded the authority granted to his office by Congress, Judge Morris points out that in an amendment to the original act empowering the seizure of alien property it is specifically stated that if in the judgment of the President the disposal of such property by other than public sale shall be "in the public interest" the Alien Property Custodian may dispose of such property "as though he were the absolute owner thereof." Such broad powers would imply the right to destroy or otherwise dispose of the property in any way which seems desirable, without regard to any question of remuneration received therefor.

A mass of testimony is cited to support the contention of the defendant that this sale was made strictly in accordance with "the public interest"; that the development of an independent organic chemical industry in the United States was impossible without the control of the patents involved; that the patents themselves were not designed to be workable instruments by the Germans, but were simply used to prevent manufacture and sale of the products patented, in the American market, by others than the German owners.

Referring to the right of confiscation in war time of enemy property, Judge Morris cites a number of legal precedents holding that a Government may confiscate property of any kind regardless of its ownership, if such confiscation seems necessary or desirable in connection with the prosecution of the war.

Referring to the Government's contention that Mr. Polk, in signing the executive order authorizing this sale, acted as a private individual and not in his capacity as "Solicitor of the Department of State," simply because his designation as above was omitted from the formal order, Judge Morris holds that this is immaterial; that it was obvious that Mr. Polk was acting in such capacity, and cites numerous legal precedents for holding such opinion.

After describing the charter of the Chemical Foundation, Inc., which provides that non-exclusive licenses to operate under any of the seized patents on equal terms must be granted to any American manufacturers, and discussing the personnel of the directors and trustees of the Foundation, Judge Morris expresses himself as follows:

> The devotion of the property to the public use stands not upon written documents alone. It has a deeper foundation—the property is in the keeping of men who have in its management no selfish interest to serve and whose devotion to the public interest has been established. No better plan for devoting the property to the public use has been suggested. The plan has stood the most severe of all tests—actual trial. The defendant has kept the faith. This it has done not only by granting licenses in furtherance of the purpose for which defendant was chartered, but also at its great expense by the distribution of books and pamphlets showing the national necessity for the practical development of chemical science in America. If, perchance, those heretofore engaged in the chemical and allied industries have derived an incidental advantage from the plan, that incidental result cannot invalidate a transaction lawfully consummated in the public interest. The same charge would lie against the validity of every tariff act.
>
> The transaction in suit was not one granting a subsidy to a private industry. It was a devotion in the public interest of the property to a public use. The property is available for any American citizen, co-partnership or corporation that desires to use it for the advancement in the United States of the only science or industry to which, by reason of its nature, that property is applicable. The sale was in effect a sale to America and its citizens, not to persons then engaged in chemical and allied industries.

Discussing the question as to the scope of the authority delegated to the President by the act of Congress, Judge Morris says:

> The statute does not require him to disclose to the purchaser the evidence upon which his reasons were based. The statute does not limit the executive in the assignment of reasons to such as may be supported by legal evidence or by facts available to the public. Obviously, if the validity of a sale of enemy property to a purchaser may be challenged at any time by the United States on the ground that the reasons assigned by the President in the public interest were not supported by the facts and the sale be set aside unless the purchaser succeeds in establishing by legal proof in a court of law that the President's reasons were supported by facts, few, if any, purchasers could meet the burden. They would be wholly at the mercy of the seller, the United States.
>
> A sale of that character would be nothing more than a game of chance in which the result—the stability or validity of the sale—would always be within the control of the seller. A sales statute exposing such a solecism would be not only useless, it would be paradoxical.

In regard to the Government's charge that the sale in question was made as the result of a conspiracy between certain interested parties, Judge Morris says:

> The bill of complaint charges that the seizure and sales of the property in suit were induced, brought about and accomplished by and through a combination, scheme, and conspiracy of certain representatives of the chemical and dye industires. . . . Notwithstanding the generality of the allegations and the unlimited opportunity afforded the plaintiff to support them by evidence the charges of deception and conspiracy have failed utterly.

After citing testimony wherein it was brought out that the allegations made by the Alien Property Custodian who succeeded Mr. Garvan, which, as contained, in the Government's bill of complaint, charged that facts were withheld from him with intent and purpose to secure the execution of one of the later transfers of patents to the Foundation, could not be substantiated in any single particular by the Alien Property Custodian when on the witness stand, Judge Morris remarks as follow:

> Yet, the remaining like charges were equally lacking in evidential support. In fact, at the argument the plaintiff seemed no longer to press these charges against the persons alleged to be the conspirators, but it sought to have the charges sustained as against the officers of the Government who formulated and carried out in the public interest the plan of sale of the property in suit. No authority is necessary to show that this may not be done. But if that were legally permissible it would not avail the plaintiff, for such charges, too, would be without evidential support. While I know of no case where by implication of law the duty of clearing itself from imputed fraud rests upon the defendant, yet the defendant has met even this burden. The testimony of Mr. Palmer, who was neither cross-examined nor contradicted, discloses the circumstances which gave rise to the plan, and that it was at his request that representatives of the industry to which the patents in suit appertain gave their aid and financial assistance in carrying it into execution.

In the last quotation from Judge Morris's decision, he brings out what is evidently one of the actuating motives in the entire suit, namely, an effort by the Harding Administration to discredit the acts of the Wilson Administration. The Government apparently is not interested in attempting to prove a conspiracy in so far as it affects outside parties, but does endeavor to discredit and place in an entirely false light officers of the previous administration who were unquestionably actuated by motives of the very highest order.

All in all, Judge Morris's decision is thorough, logical and absolutely just. No disinterested party who followed the progress of the suit in question believed for one moment that the Government's allegations of conspiracy or lack of proper motives had foundation in fact; no one questioned that the seizure and subsequent sale of the patents to a quasi-governmental organization such as the Chemical Foundation was in the public interest; no one doubted that the control of the patents in question was essential to the proper development of a self-contained American organic chemical industry—with all that this means in assuring to our citizens a free supply of needed medicinals and to the nation a ready-made source of explosives and other martial chemicals in the event of another war; no one doubted, in fact, that the whole suit was ill-founded in law, without ground in equity, and absolutely at variance with ordinary principles of national integrity. Its obvious basis was partisan politics, fostered and abetted by German propaganda—that most insidious of all influences.

That Judge Morris saw the light, as any upright, clear-thinking, legally trained American could not have failed to do, is to his unbounded credit.

If this case is to be appealed, as is understood to be probable, it is to be hoped that the higher tribunals before which it comes may not becloud the issue with a maze of legal technicalities or permit questions of political expediency to interfere with the obvious merits of the case from the standpoint of pure equity and national well-being.

COMMERCIAL BRIBERY

EVERY once in a while the old "graft" question bobs up in connection with dyestuff sales. Personally, we do not believe that this condition is any worse in our industry than in others—certainly not so bad as in some.

The leading dyestuff manufacturers insist that this practice is no longer employed so far as their activities are concerned, and in the great majority of cases this insistence can probably be taken at its full face value. On the other hand, it is not difficult to find factors in the sale and distribution of dyes who are equally positive that the practice is as universal as it was before the war.

As usual, the real truth probably lies somewhere between these two extremes; the evil has not been completely discontinued, but it is exceedingly doubtful whether it is anywhere near as bad as it was prior to 1914.

There are many reasons for this, but probably the most effective one is the growth in the employment of technical chemists by the mills—men who exercise a more or less complete control over dyehouse procedure, and who, being high-class professional men, are out of reach of those nefarious influences which were formerly believed to be indispensable in the sale of dyestuffs.

As is well known, the Federal Trade Commission has shown considerable activity in recent years on this question; but, unfortunately, its action has been limited by the fact that it possessed no punitive powers. It has been able to do no more, practically, than to indict an offender, slap him on the wrist and tell him not to do it again. Many of the industrial States have enacted anti-bribery laws, but these also have been, for the most part, "without teeth," and but little attempt has been made to enforce them.

Some two or three years ago an organization was formed in New York under the name of the Commercial Standards Council, the membership of which is composed of a large number of national trade associations, and its principal effort has been to awaken public opinion, through these member associations, to the blighting menace to the integrity of American business which is inseparable from the practice of bribery.

It was through the activities of this council that the recent law against bribery was adopted by the New Jersey Legislature, and which is peculiar in that, for the first time, immunity is granted to either the giver or taker of a bribe who shall first disclose the facts of the transaction to a district attorney. This is probably the most effective way of eliminating the evil; an element of doubt and uncertainty is introduced, as neither party to a bribe can ever be sure that he will not be "given away" by the other in order to save his own skin.

The Commercial Standards Council also was instrumental in having a similar bill introduced in the national legislature containing the same "immunity" clause, and this bill did actually pass the House of Representatives by a respectable majority and with but little opposition, only to find a temporary grave in the Senate under the wordy avalanche which characterized the close of the session.

This bill, or a similar bill, is to be introduced again after the assembling of Congress in March, and there seems to be sufficient support evident in both Houses to insure its passage.

Bribery will then become a Federal offense, and the Federal Trade Commission will be in possession of punitive powers which will enable it to make its decrees effective, and the way of the transgressor will be made hard.

If we may venture a criticism of the activities of the Federal Trade Commission so far, we should say that, in its desire to exterminate this unquestioned evil, it has "leaned backward" in its upright attitude.

Flagrant instances of wholesale bribery have been passed over, and there has been too much of a relentless pursuit of the giver of cigars and an occasional dinner.

We have never been able to convince ourselves that the recognition of favors already received by the giving of Christmas presents, cigars, dinners and theater parties was anything but a method of creating and maintaining good-will, and that it should not be classed with the barefaced and deliberate adding to a price in order to provide a margin for the reward of the individual who has the placing of the order. It is, perhaps, unnecessary to point out that all such gratuities are added to the price eventually, and constitute a penalty imposed on the firm or mill for whom such purchases are made.

Public opinion is unquestionably awaking as regards this problem, and the folly and stupidity of it is becoming more generally appreciated. The ineffaceable damage that is done to the good name of American business by the prevalence of a general system of bribery to influence the placing of orders is so unmistakable and indisputable that it is seldom one can find anyone to justify it, and when a practice is universally condemned it soon falls into desuetude.

All progressive and ethical elements in the industry should give this matter attention, considering the best methods for its control or extermination, to the end that, in the new era which is opening up to the American dyestuff industry, it may become universally known that dyes are sold on their merits and not by methods which have no justification or excuse.

T. C.'S COLUMN

THE CO-OPERATIVE CLEARING-HOUSE

THESE are the days when the preaching of co-operation is rampant, and its practice is, at least, improving. "Many hands" not only "make light work" but accomplish tasks otherwise impossible. Can *we* apply these notions, too?

Textile chemistry is a realm of inconsistencies. These inconsistencies have explanations, but nobody can study enough of them to arrive at general rules. We are all so busy with our particular problems that we do not give enough time and attention to what lies beneath.

One of our main troubles is that textile knowledge is not definite enough. This is largely because textile materials are not definite, and because of the innumerable variables from start to finish of textile manufacturing. Some day when our knowledge has vastly increased the complex things will all appear simple.

They will not, however, seem much simpler until we put forth quite an effort to make them so. If all textile chemical facts and ideas could be assembled "unto one place" and carefully assorted into the classes *Opinion* and *Knowledge,* then sifted and again classified by subjects, we would have the finest sort of material on which to base a few conclusions.

This, in substance, is our theme. We know it is not possible to accumulate *all* the knowledge on any subject, but cannot some practical way be found to put a more definite and more reliable type of information on record than is to be found in our current books and papers? Don't mistake our intention. The books and periodicals are so good now that I buy them almost by the wholesale, but there always seems to be something lacking.

Take the subject of bleaching. We can easily read how it is done, but we cannot go ahead and do it according to directions, for various reasons which usually the book will not mention. Assume that a kier load of yarn has been boiled off ready for bleaching; would you "sour" it? You would if you had kier stains; but how about souring it to accelerate the bleach a little? Or would you need to sour it at all if you were using a solution of chlorine a little on the acid side? Why? Is a fairly rapid bleach just as good as a slower process? How do you know? Does exposure to the air make any real difference in the result or in the time required?

A person installing a new bleaching equipment or trying to improve an old process is confronted with just such questions. He needs not only the correct answers, but must have them in great detail and must recognize when circumstances demand exceptions. There is plenty of theory but few records of just how that theory has worked out in practice. It is also easy enough to see where detailed, reasonably reliable information of this type would be of great help to many of the men who are earnestly seeking to improve their present methods and quality, or lower their cost.

Other modifying circumstances intrude. The individual making inquiries at half a dozen places will find that the same work is being done in half a dozen different ways. Each has a reason, or thinks he has. In view, however, of the diversity of practice, they cannot all be doing it best or most economically. Probably too frequently the operator has found that a certain set of conditions gives the right results and he is wise enough to let well enough alone.

Where the data as assembled were too conflicting, the points at issue would be checked up, which immediately suggests research. There are many kinds of research and the term does not necessarily involve extensive laboratories and expensive staffs. You yourself can do a lot of research in your head. The famous Willard Gibbs worked out the fundamentals of a large portion of physical chemistry on paper. Later generations have confirmed his work in laboratories and found it good. Collecting some figures in the mill, thinking about them and drawing a conclusion may be as truly research as measuring hydrogen ion concentrations, or speculating about the colloidality of dyes.

Let us, however, forget the word research and think about collecting data. Textile chemical work is under the supervision of a host of chemists, dyers, bleachers, etc., some with much education and some with none, but all with ideas on their work. Some are secretive by choice, a few from necessity, but a rapidly increasing number feel free to compare notes.

Exchanging experiences with a fellow worker is one of the most broadening of influences. Comparing ideas with a dozen or two is proportionately more valuable. If we could, then, have the average opinion or an intelligent statement of the main disagreeing opinions we would have the closest possible approach to authoritative data.

How much can be obtained without jeopardizing the positions of individuals or the private interests of firms is a difficult question, but it seems that there are now enough open-minded people in all textile lines for a real beginning to be made. Something of the sort has already been attempted, but we cannot say with just what success. A Southern textile association has conducted questionnaires covering practice in carding, spinning, etc., of cotton, and has had the results read in general meetings, discussed and published.

Such things depend very much on the interest taken by a few live committee members, or, perhaps better, on the activities of a paid secretary. However, could not such an idea be cautiously tried out by selecting a subject, asking certain definite questions about it, in-

cluding reasons for or explanations of the answers, and requesting any pertinent additional information, then inviting free-for-all comment or possibly asking particular individuals for opinions? Try to get actual operating details, but above all the reasons for them—for until the reasons are understood we cannot claim a thorough grasp of textile chemistry.

This proposition presents a good-sized order, but the society or periodical that can do it will make a lasting contribution to the industry. Visionary, impractical—oh, yes, and then some—but what a joy there is in pleasant dreams! T. C.

HOPPIN ADDRESSES SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS' ASSN.

At the regular monthly luncheon-meeting of the Dyestuff Section of the Synthetic Organic Chemical Manufacturers' Association, held at the Hotel Commodore, January 11, the guest and speaker was Hon. William W. Hoppin, Assistant U. S. Attorney-General. Mr. Hoppin spoke of the work being done by his department in connection with dyestuff tariff matters. His remarks, in part, were as follows:

"It is a great pleasure to be able to address the members of the Dyestuff Section of your Association and to tell them something of the work of the Customs Division of the Department of Justice and its relation to the interpretation of the Tariff Act of 1922 as affecting the American dye industry.

"The value to this country of an organized and profitable chemical industry was clearly proved during the war and the growth of that industry to its present position is clearly attributable to the impetus which was given to it during that period of our history. During that time war conditions effected a practical embargo on all foreign dyestuffs, thus giving an opportunity for the development of the dye industry in this country without foreign competition. Realizing, however, that with the resumption of peace with Germany our infant dye industry would be again subjected to foreign competition with a country whose dye industry was far in advance commercially of our own, Congress enacted into law paragraphs 27 and 28 of the Tariff Act of 1922, which had for its purpose the protection of this industry, as it realized the difficulties which this industry would encounter once faced with world competition, and also believed that its contribution to the welfare and business of this country was well worth preserving as a permanent industry of the United States.

"Like other new provisions of the tariff act, it was essential that a proper judicial construction be placed upon its provisions which would carry out the purpose and intent of Congress. At first there was naturally much uncertainty. Every effort was made by the appraiser at the Port of New York to meet in conference with both domestic and foreign interests and to strive to arrive at an amicable basis on which the dutiable value of this merchandise could be ascertained. The dutiable basis as fixed by the provisions of the tariff act provide for two methods of ascertaining value: (1) United States value and (2) American selling price. United States value is applied to dyes which do not enter into competition with domestic dyes. United States value is based upon the price for which such or similar merchandise is sold in the United States, less the deductions provided for in the act. American selling price is based upon the price of a domestic product similar or competitive with the imported product which accomplishes results substantially equal to those accomplished by the domestic product when used in substantially the same manner.

"Our office realized at an early period that the results of litigation under these paragraphs would be of vital importance to the dye industry of this country and that both the importing interests and the domestic interests were entitled to an early determination of the various questions involved. Much litigation has resulted and is still pending before the Board of General Appraisers, the customs tribunal designated by law to try cases relating to the tariff in the first instance, and in appeals from the decisions of the Board of General Appraisers in the Court of Customs Appeals.

"The words of the statute which I quoted as defining the American selling price have caused all of our difficulty. The words of the act which provide that any coal-tar product shall be considered similar or competitive with any imported coal-tar product which accomplishes results substantially equal to those accomplished by the domestic product have resulted in the greater part of our litigation and it is in defining the meaning of those words as relating to this industry that I believe this office has contributed most to the interpretation of the law. It was essential for the importers to ascertain what was competitive and what was 'substantially similar results,' and it was for this purpose that a series of cases were started before the Board of General Appraisers which have resulted, so far, in practically all of the important cases in victories for the Government; and while these cases have been or will be appealed to the Court of Customs Appeals, I feel that we have made a long step in advance in satisfying the court as to the proper interpretation of these sections from the standpoint of this office. It has been established that to be competitive an article need not be competitive in all respects with the imported article, provided it accomplishes substantially equal results in the uses to which the domestic product is put. The board has further decided, in a decision just rendered, that the actual strength of the imported article shall be compared for dutiable purposes with the actual strength of the American product and the value shall be determined upon a like theory. Many other instances could be cited of questions that have arisen and been decided in favor of the contention made by the Government.

"While I have stated that the Government has been upheld in these cases, it is my opinion that the construction of the law placed upon it by the Board of General Appraisers, and I trust to be confirmed by the higher courts, is a proper and fair construction of the intent of Congress in the paragraphs referred to.

"We have been greatly assisted in our work by the expert of this Association, Dr. Harrison F. Wilmot, whose knowledge of dyes and whose good judgment have been a constant aid to us. Others connected with your Association have also been of material assistance and we will look forward to the future with confidence that we can feel that the assistance which has been rendered to us in the past will be continued in the future."

TWO IMPORTANT TARIFF DECISIONS

Two important decisions were handed down recently by the Board of General Appraisers affecting dyestuff appraisals. One was the case of Benzo Red 12B, brought by Kuttroff, Pickhardt & Co. against the Government:

The essential points of the Board's decision in this case are as follows:

In this case the purchase price, invoiced according to American export selling price per kilo is $1.70. It is entered at .795 dollars per pound, and was appraised at $2 per pound, American selling price. The single General Appraiser affirmed the appraised value, and both sides appealed. Inasmuch as both sides complained of the finding of the appraiser, neither can claim any benefit from any presumption in favor of the correctness of that action.

In considering the evidence in the case the single General Appraiser found that there is an American commodity which when used in substantially the same way would produce substantially the same results, and affirmed the action of the appraiser in applying the American selling price. In our judgment, he overlooked the fact that the evidence overwhelmingly, even if not without any contradiction, shows that the imported article had three times the strength of the American product and when diluted or reduced into three parts would compete with three times the quantity of the American product. Therefore, in our judgment, the appraisal should have been at three times the value found by the appraiser and affirmed by the single General Appraiser. Therefore, after having heard argument and considered the case on the record made before the single General Appraiser, we modify the decision of the single General Appraiser and find in support of the Government's appeal that the merchandise in question should be appraised at three times the American selling price of the same quantity of the article.

The other case was that of Pyrazolone, an appeal brought by the Government from a decision by Judge Brown in favor of Sandoz Chemical Works.

The main features of this decision follow:

Inasmuch as both parties introduced testimony, the question of fact to be decided is whether or not, considering all the testimony, the weight of the evidence justified the decisions of the single General Appraiser. We cannot so hold. In the conflict of the testimony, the board does not discover weight enough to overturn the presumption in favor of the action of the appraiser, the appraiser and examiner not being sworn in the hearings. While it is true that the method of valuation is new to our law, the application of that method is to be judged and the facts connected with it and produced under it must be weighed according to the long-established and well-known rules of evidence and construction of statutes. The cases presented merely the trials of cases at law, all of which are important and in the determination of which it is important to observe the ordinary rules. It is unnecessary to decide the question so much discussed as to whether there can be such a market as it contemplated by the law in which the American selling price can be applied as a rule of measurement, without proving that that market actually functions by sales and deliveries, because the action of the appraiser which presumes knowledge of facts and compliance with the law has not been overturned by the evidence in the cases.

Therefore, the decisions of the single General Appraiser are reversed, and an order will issue sustaining the appraised value in each case.

Both decisions are signed by Judges Byron S. Waite and W. C. Adamson. The first decision clearly establishes the point that competitive products must be appraised with regard to tinctorial strength. It was hoped that the second case would decide whether a mere offer, without a consummated sale, would establish an American selling price, but the opinion evades this point.

JONES JOINS ANILINE COLOR & CHEMICAL COMPANY

According to an announcement distributed to the trade, J. B. Jones, recently president of the Dyes Distributing Corporation, has become associated as general manager with the Aniline Color & Chemical Company, 162 West Kinzie Street, Chicago, Ill.

Mr. Jones is well known to dyestuff circles in and around Chicago. Previous to his association with the Dyes Distributing Company, he was Chicago manager for the Ciba Company, and before that for Aniline Dyes & Chemicals, Inc. He was also, for many years, in charge of the Chicago office of the United Indigo & Chemical Company.

J. P. Bauer, formerly head chemist for the Dyes Distributing Company, will have charge of the laboratory of the Aniline Color & Chemical Company.

Recent Patents

Dyestuff Prepared from Orthoxylylaldehyde

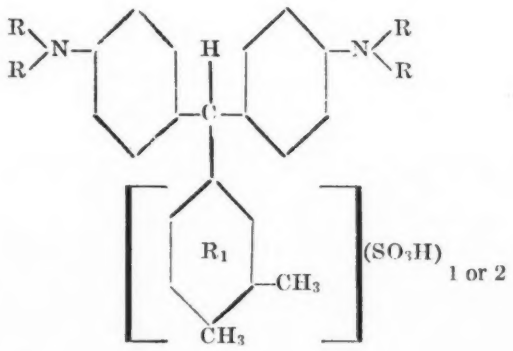
(1,470,554; October 9, 1923)

Augustus Edward Craver, Buffalo, N. Y., assignor to the Barrett Company.

Relates to the principle that the condensation of benzaldehyde or derivatives thereof with aromatic secondary or tertiary amines or derivatives thereof yield in many cases leuco compounds of valuable dyestuffs of the triphenylmethane series, the properties of which dyestuffs depend upon the composition and constitution of the intermediates used.

The present invention is based on the discovery that new and valuable dyestuffs can be obtained by the condensation of orthoxylylaldehyde mono or disulphonic acid with secondary or tertiary aromatic amines and subsequently oxidizing the leuco compound, resulting from the condensation, to the color base. These new triphenylmethane dyestuffs are of particular value in dyeing unmordanted silk and wool, and occasionally for dyeing mordanted silk and wool, blue to green shades. The dyed fabrics or other materials dyed with these new dyestuffs also form part of the present invention.

The new dyestuffs can be obtained by oxidation in acid solution of leuco bases of the triphenylmethane series having the following formula:



wherein R denotes hydrogen, alkyl, aryl, alkaryl or aralkyl groups which may or may not be substituted (e. g., CH_3, C_2H_5, C_6H_5, $C_6H_4CH_3$, $CH_2C_6H_5$, $CH_2C_6H_4SO_3H$, etc.) and wherein said groups R are substituents of an amino group attached to an aromatic nucleus which of itself may or may not contain other substituents; and wherein R represents a benzene nucleus which contains two substituting methyl groups, one in the meta and one in the para positions respectively to the methane carbon atom, and which benzene nucleus also contains either one or two substituting sulphonic acid groups, depending on whether orthoxylylaldehyde mono or disulphonic acid is used in the condensation.

The starting material for these new dyestuffs is orthoxylylaldehyde—i. e., dimethylbenzaldehyde ($CHO:CH_3:CH_3 = 1:3:4$)—which can be obtained, for instance, by the catalytic oxidation of pseudo-cumene, as described in co-pending applications, serial Nos. 514,903 and 516,124, filed November 4, 1921, and November 18, 1921, respectively, and which can be readily converted into mono and disulphonic acid derivatives.

Orthoxylylaldehyde monosulphonic acid can be prepared as follows:

Twenty parts by volume of orthoxylylaldehyde are gradually added to 100 parts by volume of fuming sulphuric acid containing 63 per cent free sulphur trioxide, maintaining the temperature of the liquid at 0-5 deg. Cent. After the aldehyde has all been added, the mixture, while being maintained at this temperature, is agitated for about one hour or until a sample of the liquid indicates no unchanged aldehyde as shown by its complete solubility in water. The mass is then introduced into a large quantity of cold water (2 to 3 liters) and neutralized with milk of lime. The precipitated calcium sulphate is filtered off and washed. The filtrate contains the calcium salt of the monosulphonic acid of orthoxylylaldehyde. The free acid is then liberated by adding just enough sulphuric acid to precipitate as calcium sulphate the calcium in the calcium sulphonate. The precipitated calcium sulphate is filtered off and the filtrate evaporated to dryness and the orthoxylylaldehyde monosulphonic acid is thus obtained as a white crystalline mass. Under the above conditions of sulphonation it is possible to obtain a yield of about 90 per cent of theory of the monosulphonic acid.

By changing the conditions of the sulphonation it is possible to introduce two sulphonic acid groups into orthoxylylaldehyde. To this end 20 parts by volume of orthoxylylaldehyde are gradually added to 160 parts by volume of fuming sulphuric acid containing 63 per cent free sulphur trioxide maintained at a temperature of 80 deg. Cent. The mass is then held at 80 deg. Cent. for about twenty hours while being stirred, after which the temperature is gradually raised to about 150 deg. Cent. during a period of two hours. The mass is allowed to cool, after which it is introduced into about 2 to 3 liters of cold water and neutralized with barium carbonate or milk of lime. The insoluble barium or calcium sulphate which thus precipitates is filtered off and washed. Just sufficient sulphuric acid is then added to the filtrate, which contains the barium or calcium disulphonate or orthoxylylaldehyde (depending on whether barium carbonate or milk of lime is used to neutralize the sulphonation mass) to completely precipitate the barium or calcium present. The filtrate, after the precipitate of barium or calcium sulphate has been filtered off, is then evaporated to dryness and the orthoxylylaldehyde disulphonic acid obtained as a white crystalline mass. The barium salt of the acid

forms white needles on crystallization from water and is somewhat less soluble than the corresponding calcium or sodium salt. Under the above conditions of sulphonation, it is possible to obtain a yield of about 70 per cent of theory of the disulphonic acid derivative of orthoxylylaldehyde.

Both the mono and disulphonic acid derivatives of orthoxylylaldehyde are employed in producing new triphenylmethane dyestuffs, of which this is a specification. The following example will serve to illustrate the procedure used in producing the new dyestuffs. The parts are by weight:

Five hundred parts of an aqueous solution containing 10 per cent orthoxylylaldehyde monosulphonic acid are boiled with 63 parts of dimethylaniline and 6 parts of sulphuric acid for fifteen hours. Sodium carbonate is then added to the solution until a faint alkalinity is reached and the dimethylaniline which has remained unacted upon is distilled off in a current of steam. The residual solution is diluted with water to about ten times its volume, acidulated by the addition of hydrochloric or acetic acid, and the leuco base thus formed is then oxidized by means of the desired quantity of lead peroxide; as, for instance, 200 parts of a 30 per cent paste of lead peroxide. When the oxidation is complete, there is added a concentrated solution of sodium sulphate in an amount sufficient to precipitate the lead salt as lead sulphate, the solution is filtered from the lead sulphate, and the filtrate which has been made alkaline by the addition of ammonia is evaporated to dryness and the dyestuff thus recovered. The dyestuff thus obtained from the orthoxylylaldehyde monosulphonic acid forms a copper-like powder readily dissolving in cold and hot water with a greenish blue color. The addition of sodium hydroxide or acetic does not change its color. It dyes silk and wool in an acid bath bluish green shades, considerably bluer than the shades produced by ordinary malachite green; and the dyestuff is further distinguished by its relatively great fastness to alkalis, light and washing.

By starting out with an equivalent quantity of orthoxylylaldehyde disulphonic acid and using a procedure similar to that described above for the monosulphonic acid derivative, a dyestuff is obtained which has properties similar to that derived from the monosulphonic acid derivative, and it was found that it has dyeing properties closely agreeing with those of the mono derivative.

The condensation of the new sulphonic acid derivatives of orthoxylylaldehyde with aromatic amines or derivatives thereof, may be effected and the dyestuffs isolated by ordinary methods employed in the condensation of similar compounds.

Analogous leuco compounds and their corresponding oxidation products as dyestuffs may be produced by substituting in the above example for dimethylaniline, the equivalent quantity of other aromatic amines —e. g., diethylaniline, ethylbenzylaniline, ethylbenzylaniline, sulphonic acid, monomethyl-o-toluidine, dimethyl-o-toluidine, and the like—or a mixture of equivalent quantities of various aromatic amines may be employed; as, for example, a mixture of one equivalent of dimethylaniline with one equivalent of ethylbenzylaniline sulphonic acid, etc.

Thus, by starting out with orthoxylylaldehyde mono or disulphonic acid, it is possible to obtain triphenylmethane dyestuffs which are soluble in water and, in the form of a salt or as base, dye wool and silk, from an acid bath desirable blue to greenish shades which are fast to light, alkalis and washing.

In the claims it will be understood that the term "univalent substituents" includes univalent substituents which are alike or different and include hydrogen and alkyl, aryl, aralykl or alkaryl groups which may or may not be substituted; such as, for example, CH_3, C_2H_5, C_6H_5, $C_6H_4CH_3$, $CH_2C_6H_5$, $CH_2C_6H_4SO_3H$, etc., that the term "aromatic nucleus" denotes and includes a benzene nucleus which may or may not otherwise contain substituents, such as methyl, halogen, hydroxyl, sulphonic acid groups, that the term "orthoxylylaldehyde sulphonic acid" includes the mono and disulphonic acid, and that the term "dyestuff" or "dyestuffs" included the base or salts of the base.

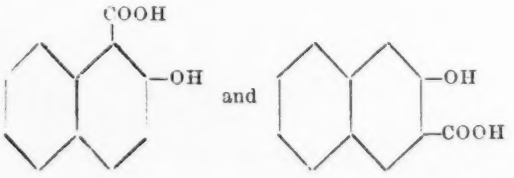
Process of Making 2-3 Oxy-Naphthoic Acid

(1,470,039; October 9, 1923)

Roger N. Wallach, of New York, N. Y., assignor to the Grasselli Chemical Company.

This relates to an improvement in the process of reacting with carbon dioxide upon alkali-beta-naphtholate, which improvement reduces to a minimum any secondary reactions and allows of a very high yield of 2-3 oxy-naphthoic acid. It consists specifically in dissolving the alkali beta-naphtholate in an appropriate solvent and acting at relatively high temperature and pressure with carbon dioxide upon this solution.

By reacting with carbon dioxide upon alkali-beta-naphtholate two isomers are formed: the alkali salt of the 2-1 oxy-naphtholate acid and the alkali salt of the desired 2-3 oxy-naphthoic acid:



At a relatively lower temperature; that is to say, below about 180 deg. Cent., where the action of carbonic acid gas runs smoothly—the 2-1 derivative is formed in larger amounts; at higher temperatures the formation of the 2-3 derivative prevails, but the 2-1 derivative formed at the same time undergoes second-

ary reactions with formation of water, which decrease the yield of the desired product and form tarry matters; these latter are more or less difficult to separate from the oxy-naphthoic acid.

In order to decrease the formation of such by-products and decomposition products, the concentration of water must be kept as low as possible. This might be achieved by keeping the temperature below the point where the decomposition of the 2-1 oxy-naphthoic acid becomes noticeable. Under such conditions, however, the amount of 2-3 isomer obtained is relatively small, and inasmuch as there is only a very limited technical use for the 2-1 oxy-naphthoic acid the process becomes very uneconomical.

The action of carbon dioxide gas upon alkali-beta-naphtholates can be carried out at a temperature above the normal decomposition point of the 2-1 oxy-naphthoic acid, provided the alkali-beta-naphtholate be dissolved in an appropriate solvent and the carbonic acid gas permitted to react upon such solution. In this case not only is the concentration of the water formed by secondary reactions much lower, due to the diluent effect of the added solvent, but at a given temperature the proportionate amount of 2-1 isomer, and consequently the corresponding amount of decomposition products, naphthoxanthrone and water derived therefrom, is much lower.

As a solvent in which to dissolve the alkali-beta-naphtholate for this reaction beta-naphthol is preferred. At the reaction temperature alkali-beta-naphtholate is soluble or miscible in all proportions in beta-naphthol, and such solutions form thin liquids which are easily stirred and through which carbon dioxide can be bubbled without any difficulty. Other phenolic bodies, including alpha-naphthol, phenol, etc., might satisfactorily perform the functions of a solvent, but are far less desirable than beta-naphthol by reason of the contamination of the end product.

The process is further illustrated by the following examples, to which, however, the invention is not limited:

Example I.—In a suitable apparatus equipped with a stirrer and appropriate devices for measuring temperatures and pressures, 500 parts of anhydrous sodium beta-naphtholate are dissolved at 225 deg. Cent. in 432 parts of beta-naphthol. Carbonic acid gas is pumped into this solution so as to reach a pressure of 200-300 pounds per square inch. The carbonic acid gas is readily absorbed. The pressure of 200-300 pounds and a temperature of 225-250 deg. Cent. are maintained for about one hour. After cooling, the contents of the apparatus are extracted with water and the reaction products; the sodium salt of the 2-3 oxy-naphthoic acid and beta-naphthol are separated by well-known methods.

Example II.—Four hundred and thirty-two parts beta-naphthol and 192 parts technical potassium hydroxide are dissolved in as little water as possible. The solution is then evaporated to dryness and dehydrated at high temperature. To the anhydrous solid potassium beta-naphtholate thus obtained, 450 parts of molten beta-naphthol are added. The naphtholate dissolves; and the solution is heated to 250 deg. Cent. Carbon dioxide is pumped into this solution and a pressure of 200-300 pounds per square inch maintained for an hour. After cooling and releasing the excess pressure, the 2-3 oxy-naphthoic acid formed is separated from the beta-naphthol by well-known methods.

NEW PROCESS OF BLEACHING AND DYEING IN ONE OPERATION

Among recent discoveries in connection with the finishing division of the textile industry, the Autogyp process deserves some attention. It is claimed that this process enables the dyer to dye all shades, particularly in light and bright tints, without the necessity of previous bleaching. Up to the time when this new method was offered to the textile industry, a preliminary requirement of dyeing cotton was bleaching. The manufacturers state that the new process bleaches and dyes in one bath. Furthermore, it is claimed to eliminate specks, motes, loaf and shives. The use of chlorite of lime or other hypochlorites is obviated.

The process is effected in reel dyeing machines, and no kier is needed. It is used to advantage in dyeing warps on the beam, cotton yarns in the skein, and knitted glove cloth, such as Chomoisette, Suedetex, Atlas Cloth, etc. As it saves time, and boiling out in kiers or other appliance with the disagreeable bleach which may injure the fiber, economy is claimed as one of the advantages.

Without this double process six steps are necessary to carry out dyeing and bleaching. In addition to the economies mentioned above, it is claimed that the process saves some shrinkage, tensile strength, labor, considerable water and steam, and all chemicals used in chloride of lime bleaching. It is said to dye evenly and level, producing uniform shades and very satisfactory finish.

In using this process the material is run into the dyeing machine and thoroughly wet out in any convenient manner. Sufficient cold water to cool the bath and in which to properly work the material is run in the machine. Two or three per cent of Autogyp, dissolved in cold water and suitably diluted, is then added to the bath and the goods allowed to run ten minutes. Steam is then turned on and the bath allowed to come very gradually to a boil, and is held at or very close to a boil for one hour. Steam is then shut off and the goods allowed to run thirty minutes longer without steam. The bath is then drawn off and the goods rinsed twice and extracted.

The Standard Silk Process Corporation, of Paterson, N. J., capitalized at $250,000, now employs 500 operatives on "Standard Process" (patented) for skein silk in the gum for use in piece dyed goods. The plant is equipped with four boilers and has a capacity of 10,000 pounds per day.

Trade Items

C. H. STONE JOINS GRASSELLI

Charles H. Stone, who for the past nineteen years has been connected with the distribution of dyestuffs in America, has become associated with the dyestuff department of the Grasselli Chemical Company, in the capacity of assistant to the general sales manager. Mr. Stone will be attached to the Charlotte, N. C., division and will confine his efforts to the South.

During 1923 Mr. Stone was sales manager of the Newport Chemical Works, Inc. Prior to that he was for some time in charge of the distribution of reparations dyestuffs through the Textile Alliance, Inc. He had previousiy served for some time as vice-president of the Atlantic Dyestuff Company, was associated with William Beckers at the time of the merger forming the National Aniline & Chemical Company, and had received his early training, prior to the war, with the Bayer Company.

Mr. Stone enjoys a very large acquaintance in the dyestuff field, and his many friends will wish him well in his new connection.

MICHIGAN ALKALI OPENS SALES AGENCY

The Michigan Alkali Company and Edward Hill's Son & Co. announce the termination of the agreement by which Edward Hill's Son & Co. have acted as sales agents for Michigan Alkali. Sales are now made and existing contracts cared for by the general sales department of Michigan Alkali, 21 East Fortieth Street, New York. E. M. Taylor is sales director. The change was effective January 1.

It is reported from Greenville, S. C., that the Southern Bleachery will start operation in a part of its new plant during the latter part of this month. When in full operation the plant will employ about 500 people.

The Textile Finishing Products, Inc., has been organized at Lincoln, R. I., under the laws of Rhode Island, with authorized capital of $10,000. Kirk Smith, Robert E. Jacobson and Elmer E. Tufts, Jr., are the incorporators.

The Severn Mills Company, Readville, Mass., noted incorporated some time ago, has recently started operation of a wool scouring plant on River Street. The building, a brick structure containing 102,000 square feet of floor space, was formerly known as the Readville Cotton Mill. Three boilers (600 h.p.) are installed. Construction of a dyehouse is contemplated. Edward D. Morgan is president, John W. Dahl vice-president and Edgar N. Hunt treasurer. The company maintains an office at 170 Summer Street, Boston.

DR. BAEKELAND ELECTED PRESIDENT OF AMERICAN CHEMICAL SOCIETY

Dr. Leo Hendrik Baekeland, internationally known for his invention of bakelite, and honorary professor of chemistry in Columbia University, has been elected president of the American Chemical Society for 1924. Dr. Baekeland, though a native of Ghent, is, according to the statement of the Society, "inseparably identified with the most fruitful era in the advance of chemical science in this country."

"Dr. Baekeland's crowning work," it was said by Dr. C. F. Chandler, Mitchill Professor Emeritus of Chemistry in Columbia, "is the solving of the mysteries involved in the action of formaldehyde upon phenols, and giving to the world the new material bakelite."

Dr. Baekeland has behind him a thorough education in science and years of practical experience in many fields of chemistry. It is believed he will greatly aid the Society to carry on extensive work in both industrial and medicinal chemistry.

The next national meeting of the American Chemical Society, it was announced, will be in Washington during the week of April 21.

NEW OFFICERS OF AMERICAN CHEMICAL SOCIETY NEW YORK SECTION

C. E. Davis, chief chemist of the National Biscuit Company, has been elected chairman of the New York Section of the American Chemical Society for 1924. Mr. Davis succeeds Dr. Charles A. Browne, recently appointed chief of the United States Bureau of Chemistry.

P. A. Levene, Rockefeller Institute, was named vice-chairman, and D. H. Killheffer, associate editor of The Journal of Industrial and Engineering Chemistry, secretary-treasurer.

The new executive committee is composed of Prof. H. R. Moody, College of the City of New York; Prof. R. R. Renshaw, New York University; Col. Raymond F. Bacon, chief of the Technical Division of the Chemical Warfare Service, A. E. F., and H. B. Faber, consulting chemist.

The membership of the New York Section, it was announced, is now 1,800, representing all fields of chemical science, including industry, education and research. The new national president of the society, Dr. Leo Hendrick Baekeland, is a member of this Section, which during the coming year has planned an active program.

Ratepayers have been called upon to vote on a by-law to give a waterfront site and exemption from taxes for ten years to the Dye & Chemical Company, of Canada, Ltd., Kingston, Ont., which will erect a modern factory and manufacture dye, textile and other chemicals. It is stated that $2,000,000 will be put into the factory which will be the first of its kind to be established in the British Dominions. Dr. F. G. Atack is head of the company to be incorporated.

CAUSES OF VARIATIONS IN SHADE OF COLORED PAPER

One very annoying feature in the manufacture of colored papers is the fact that when making a repeat order of a certain shade it is rarely possible to blindly use the color formula established during the initial run of this shade, although the furnish and manufacturing conditions appear to be identical with the first run. With very few exceptions, a change in the previous formula and a variation in the proportions of the necessary colors will be required on each succeeding run. Quite frequently the causes of this are not clearly recognized. Sometimes when new shipments of colors are used for subsequent runs of a certain shade and a change in a previously established formula appears necessary, the blame is put on the color with the statement that the new shipments are not equal to former deliveries in either strength or shade. With very few exceptions such charges are unjust, and by giving the matter a little thought it becomes plain that the causes for such variations lie somewhere else entirely.

Taking for instance a furnish containing a large percentage of unbleached sulfite, it is recognized by practically every papermaker that there exists a vast difference not only between sulfite from different manufacturers but also between the various batches of sulfite from one and the same mill. This may be due to a difference in the wood, in the cooking process, the strength of the acid used, or the length of the cooking time. We all know that certain grades of sulfite produce a much stronger sheet of paper than other grades and that some sulfite requires great care in the beating and jordaning to get satisfactory results, whereas, on some other grades you simply "cannot go wrong" in the beating. It is also well known that the color of different batches of sulfite at times differs widely.

All this has a vital influence on the final outcome of a shade of paper. A free or fast cook sulfite will not take most colors in the same degree as a slow cook, and the greater the difference in this respect between two batches of sulfite, the greater will be the difference in shade resulting from the same color formula.

If the initial run was made with a slow sulfite and a subsequent run with a free cook the formula established in the first run will produce a shade much less deep in the second case and vice versa. Consequently a different color formula will have to be established in the second run and this formula again may have to be altered in subsequent runs to meet altered conditions.

What is true of unbleached surfite is also true of other materials, like groundwood or kraftpulp, and to a lesser degree even of bleached sulfite or soda pulp and ragstock. On bleached stock the degree of bleaching has a great influence on the final condition of the stock, not only as regards color and quality of the finished paper but also as regards the degree of freeness or slowness, and consequently the matching of the desired shade.

Another factor that has a great influence on the final shade is the speed at which the paper is made and the rapidity with which it is dried. If, on a second or third run of a colored paper, the speed of the machine is higher than during the initial run, this necessitates a higher temperature in the driers and causes a more rapid and violent drying. This has a decided influence on the shade as to actual tone and even or uneven dyeing in the case of a great number of dyes, especially acid dyes, and also some of the basic dyes, such as Auramine.

Needless to say that variations in the quantities of materials furnished to the several beaters cause variations in the shade of the paper. It is not a rare occurrence to have 1,000-pound beaters at times loaded with 1,100 pounds material and at other times with only 900 pounds. Inaccuracy in measuring out size and alum will also affect the shade in many instances, especially on acid colors, and the same is true where China Clay or other fillers are to be used.

In summing up, it might be said that it is well worth while to pay close attention to the conditions of the stocks to be used at various times for colored papers and to select as much as possible materials which conform closely to the ones used in a previous run. Strict supervision over the various phases of preparing the furnish and the manufacturing of the paper will aid in eliminating to a great extent most of the above mentioned disturbing factors.—Dyestuffs (Copyrighted by National Aniline & Chemical Company).

The United States Testing Company, Inc., has just published a booklet of useful tables of weights and measures, textile tables, physical tables and chemical tables. A descriptive story of the work of the company, with a full explanation of the standard tests made for the various industries which it serves, is also outlined.

A limited list of useful books and periodicals which may be used as a good working beginning of a more extensive library for textile manufacturers and mill laboratories is outlined. These include books under the following heads: "Textile Fibers, Manufacture, Tests and Analyses"; "Bleaching, Dyeing, Printing and Finishing"; "Chemistry and Biology"; "Physics, Microscopy and Photography"; "Dictionaries and Reference Books"; "Periodicals."

The booklet may be had at a nominal charge upon application to the United States Testing Company, at 340 Hudson Street, New York City.

The officers and directors of the Chemical Equipment Association held an important meeting during the latter part of December, at which an exposition was planned of chemical equipment, accessories and essential raw products.

Reports of various committees were reviewed and the growth of the recognition given the association by the chemical industries as headquarters for equipment information was a special point of comment.

NEW ALTHOUSE COLORS

The Althouse Chemical Company announce the production of four new acid browns, in addition to their Silk Brown G and Silk Brown R which are well and favorably known on the market.

These are Azanol Brown NO, a rich medium shade; Azanol Orange Brown RY, a bright orange brown shade; Azanol Red Brown R, a moderately dark shade with a distinctly red overcast; and Azanol Dark Brown RR, a dark brown of strong tinctorial value.

These dyes are readily soluble, very level dyeing, and are remarkably fast to light. They also show good fastness to acid and alkali. They have exceptional tinctorial value, and excellent penetrative powers, and lend themselves very readily to the producing of a wide variety of shades by the ease with which they work with other colors. As self colors their quality of shade is unquestionable.

The production of these acid browns is a distinct advance in the making of coal tar dyes in America. There have, hitherto, been practically no homogeneous acid browns available for the dyeing of the endless variety of brown shades which are used in dress goods, felts, plushes, and other fabrics which are made from wool or silk, and the dyer has been entirely dependent on mixtures of red, yellow and blue for his results.

Not even before the war were such dyes available, with the exception of the Resorcins, and their production at this time must be regarded as a tribute to the efficacy of original American research.

EYESIGHT AND CHEMICALS

An Interesting Letter from "The Eyesight Conservation Council of America" Details Work That Has Been Done in One Large Dye Organization

Organized eye conservation has reduced accidents in the plant of E. I. du Pont de Nemours & Co., of Wilmington Del., according to the letter. The Du Pont Company is one of a group of leading concerns which states that systematic effort is being carried on in this field of prevention.

"If men were employed at random and put at work without an examination," the Du Pont report to the Conservation Council stated, "it can readily be seen how easily a man with one eye or with poor vision could be given work around acids and caustics in a chemical plant, which would constitute a very great risk for the employer and a grave injustice to the employee.

"Eye examinations were started at the Wilmington plant five years ago; 1,578 employees of the dye works have received eye examinations. It is the practice of the company to encourage all the plants to provide goggles for the individual worker.

"At the dye works eye protection is promoted by a Works Safety Committee, and penalties are imposed for failure to comply with the rules issued by the committee. Due to the vigilance of this committee, the eye accident reduction rate for the period during which the eye protection campaign has been functioning is 66 2-3 per cent.

"Since approximately 25 per cent of the work of the plant throughout the year is done with artificial light, thoroughly up-to-date equipment is used to provide proper lighting.

"Full advantage is taken of daylight wherever possible. The proper size lamps and the distribution of the light is determined by scientific study. When deemed advisable walls and ceilings are painted to improve the lighting system."

This important movement cannot be commended too earnestly. For many of us it is difficult to realize the degree of strain to which the eyes of workers are subjected in dye and other chemical manufactories.

The effects, though gradual and often unnoticed, are none the less disastrous and complete cure is usually difficult. In this, as in other matters pertaining to human life and health, "an ounce of prevention" cannot be rated too high; consequently, any effort on the part of individuals or groups to prevent loss of sight demands earnest support from all dye and chemical manufacturers. In fact, mere support is inadequate. What is necessary is actual *practice* of the preventive methods preached.

Four subsidiaries of the Standard Silk Dyeing & Finishing Company, Paterson, N. J., have filed articles of incorporation with a total authorized capital of more than $1,000,000. The concerns are Standard Holding Company, Standard Silk Process Company, Silk Tex Mill, and Standard Silk Service Company. Controlling interests are held by George W., William S., and Charles Cole, owners of the Standard company.

SURPLUS DYESTUFFS FOR SALE

3,790	pounds	Chrome Fast Blue 2R (Swiss)
1,390	"	Aminogene Blue RN (Swiss)
836	"	Curcuphenine (British)
11,000	"	Sulphur Green
20,000	"	Sulphur Brown
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Make offer. Samples upon application. Address Box 235, American Dyestuff Reporter.

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Thirty years' varied experience in the dyestuff business, associated with the most representative importing and domestic houses, holding positions of wide responsibility. Thorough acquaintance with all types of dyestuffs, and requirements of prominent consumers. Unqualified credentials. Presently available. All communications confidential. Address Box 242, American Dyestuff Reporter.

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An acid navy blue recommended for carbonized stock. Excellent for piece goods. Very fast to light.

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A new sulphur color of perfect solubility on the blue tone. Produces maroon shades of good brilliancy and fastness.

AMIDINE RED F

A fast direct cotton red suitable for unions, half silk work. Produces fast shades of red, which can be aftertreated.

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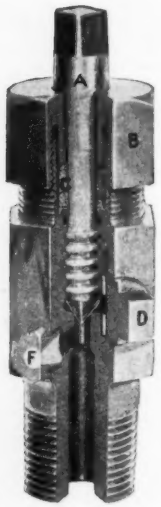

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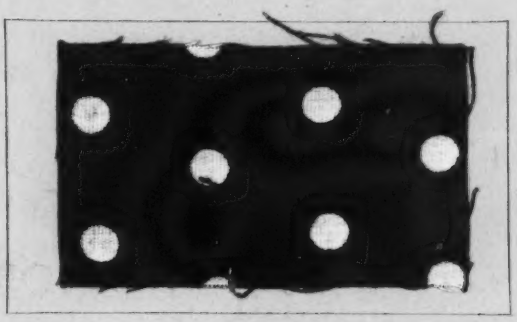

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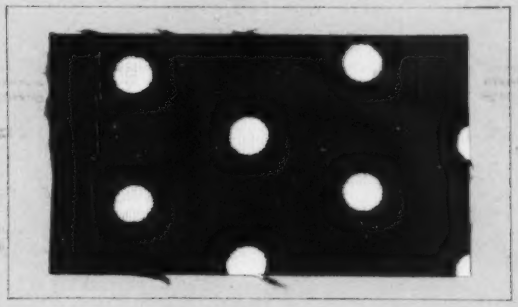

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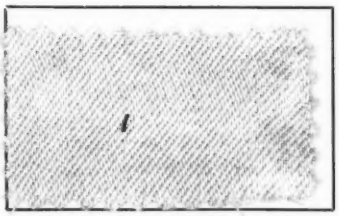

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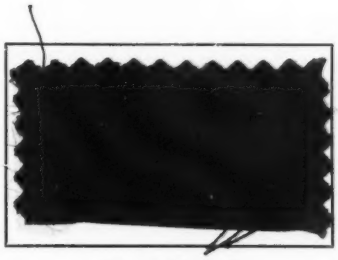

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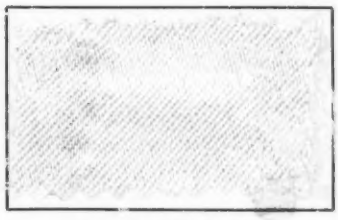

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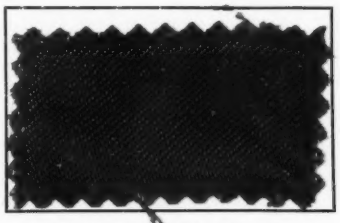

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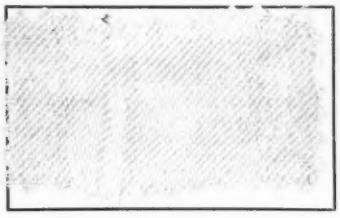

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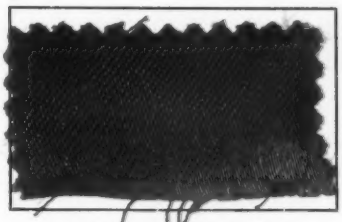

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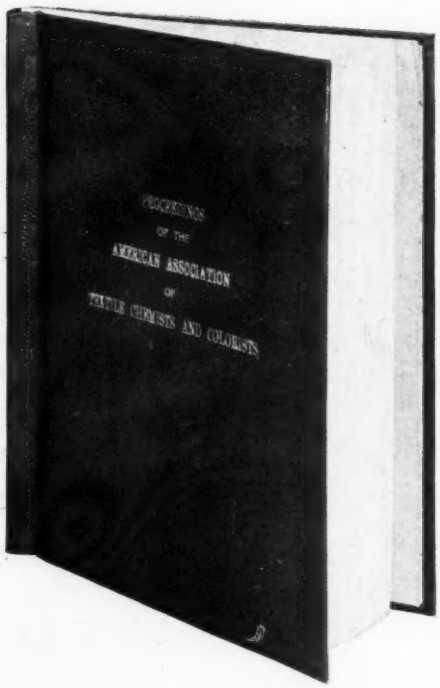

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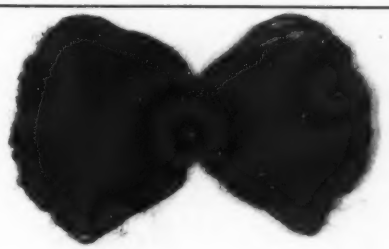

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NEW YORK, JANUARY 28, 1924

Facts and Theories Concerning Regain Propositions in Textile Materials

Answering Dr. Shorter—Schloesing's Methods—Results of Experiments on Cotton—Wool Charts—Schloesing's Regain Charts

By WILLIAM D. HARTSHORNE

Consulting Textile Engineer

[*Editor's Note—William D. Hartshorne's extensive and painstaking work in regard to hygroscopic moisture in textile material has given him the standing of a recognized American authority in regard to this subject. We cannot see that Dr. Shorter's critical statements in regard to Mr. Hartshorne's work are justified or borne out either by Shorter's experimental data or by his mistaken references to Schloesing's data. We have, therefore, asked Mr. Hartshorne to reply to Dr. Shorter's article as a matter of interest to our readers and in justice to himself and his work.—L. A. O.*]

IN the AMERICAN DYESTUFF REPORTER of November 5, 1923, is a reprint of an important paper entitled "The Moisture Content of Wool—Its Relation to Scientific Theory and Commercial Practice," by S. A. Shorter, D.Sc.

My attention was first called to this paper as it appeared in the Journal of the Society of Dyers and Colourists for September, 1923.

As this is an English publication, it seemed best to await its republication in this country before consenting to comment upon it as I had been asked to do by several of my friends who were familiar with the extent and scope of such work.

This opportunity is now offered me through the columns of the AMERICAN DYESTUFF REPORTER. I take it not so much as an opportunity to "get back at" the author, Dr. Shorter, who is personally unknown to me, but to relieve the minds of those of my English and American friends who may happen to be friends of Dr. Shorter also.

There certainly is a great deal of very valuable information contained in Dr. Shorter's article. The paper particularly attracted me by his comparison of Schloesing's figures with mine. He says:

"In view of the earlier and more accurate work of Schloesing, Hartshorne's experimental work cannot be regarded as possessing any scientific value. The results given in the 1905 paper are grossly erroneous at high humidities. The results given in the 1911 paper are in somewhat better agreement with Schloesing's results, but there is nothing in the experimental part of the paper to justify the elaborate table given at the end, in which the regains are calculated to two places of decimals and in which the humidity ranges from 0 per cent to 100 per cent. The papers subsequent to this paper contain no new experimental data. In addition to weakness on the experimental side, Hartshorne's work shows serious theoretical deficiencies. Toward the end of the 1911 paper are given a number of so-called 'laws of regain.' The first of these, called 'the general law for cotton and worsted,' is quite meaningless; the second, on examination, reduces to the mathematical truism that an equation with four constants can be made to fulfill four independent conditions. The third law states a law for worsted: 'For the same humidity the squares of the regains at different temperatures are to each other inversely as the cubes of the corresponding absolute temperatures.' This law is intelligible, but it rests on a very insecure experimental basis and is open to objection on theoretical grounds. The fourth law is a similar law for cotton, open to objection on the same grounds."

The implication in the last paragraph concerning the insufficiency of the experimental work which was the foundation for my 1911 paper need not be considered further here, except to say that this work was carried out by my very able and painstaking assistant, Richard P. Iddings, who was in charge of the Arlington Laboratory during the previous fifteen years. It is

only proper to add that the direct experiments by the 1911 method were made over a long range of comparative circumstances. This direct work covered a full year's time in the Arlington Laboratory, the results involving hundreds of different tests, no doubt on file in the archives of that laboratory and could be produced if necessary. Moreover, the results shown, as to facts at least, have not only remained unchallenged until now, but have been amply confirmed by other observers, both in this country and abroad.

Concerning my 1905 paper which Dr. Shorter, at this late day, so specifically condemns, I am glad to acknowledge the compliment of his substantial agreement with my own opinion of this paper as revealed in my subsequent writings.

Its methods were undoubtedly crude and, beyond the limits of ordinary mill practice, inaccurate. However, in order to show that within those limits it served a useful purpose, I take the liberty of quoting from a very interesting letter to me, dated October 2 of that same year, from J. H. Lester, at that time manager of the testing house of the Manchester Chamber of Commerce. Calling attention to the methods used by Schloesing for obtaining results, he says:

"They are most ingenious but too lengthy for me to describe here." Quoting further:

"I have a good deal of trouble here in convincing spinners and manufacturers of the reasonableness of the moisture standard of 8½ per cent regain for cotton, their contention being that 10 per cent would be nearer the mark, and your paper is therefore of great use to me. *It is one of the very few, if not the most important, of the contributions which seriously advance our knowledge of this neglected subject.*"

Realizing the need for further efforts to clarify the information sought, one of the methods which Schloesing[1] had proposed, it seemed to me, could be adapted to a really practical method of securing data that would be commercially available for actual use. Hence my paper of 1911. In that I call attention to the fact that my new figures produced curves on both cotton and worsted with which Schloesing's were more nearly in conformity than were shown in the earlier paper, but add: "Under the present understanding of the subject, however, the author [still] believes that Schloesing's figures are too high above 90 per cent humidity, particularly on cotton."

Now comes a very recent publication in the Textile World[2] by Tyler Fuwa, research associate, Research Laboratory of Applied Chemistry, Massachusetts Institute of Technology, quoting from both my papers and Schloesing's in comparison with results which he had obtained on cotton while investigating the phe-

[1] See Mr. Dale's translation in the Textile World Record for November, 1908.

[2] Equilibrium Moisture of Cotton, Textile World, November 17, 1923

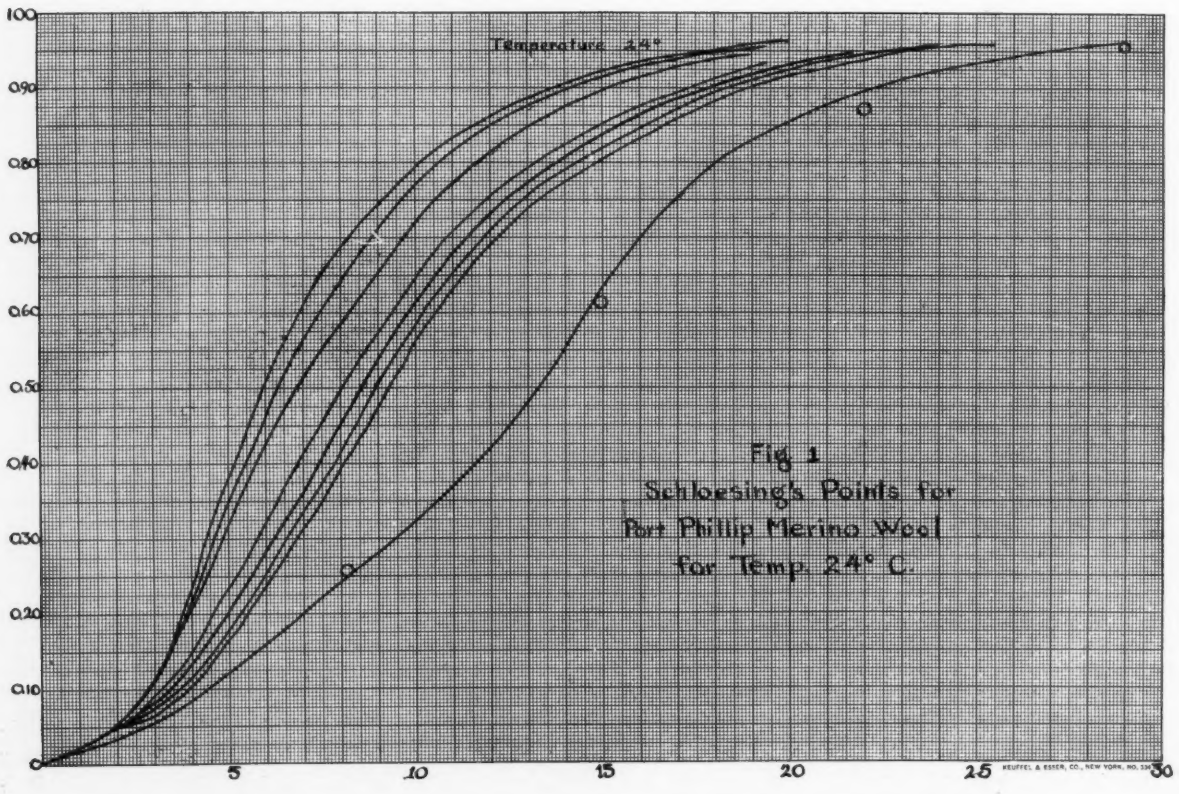


Fig. 1
Schloesing's Points for
Port Phillip Merino Wool
for Temp. 24° C.

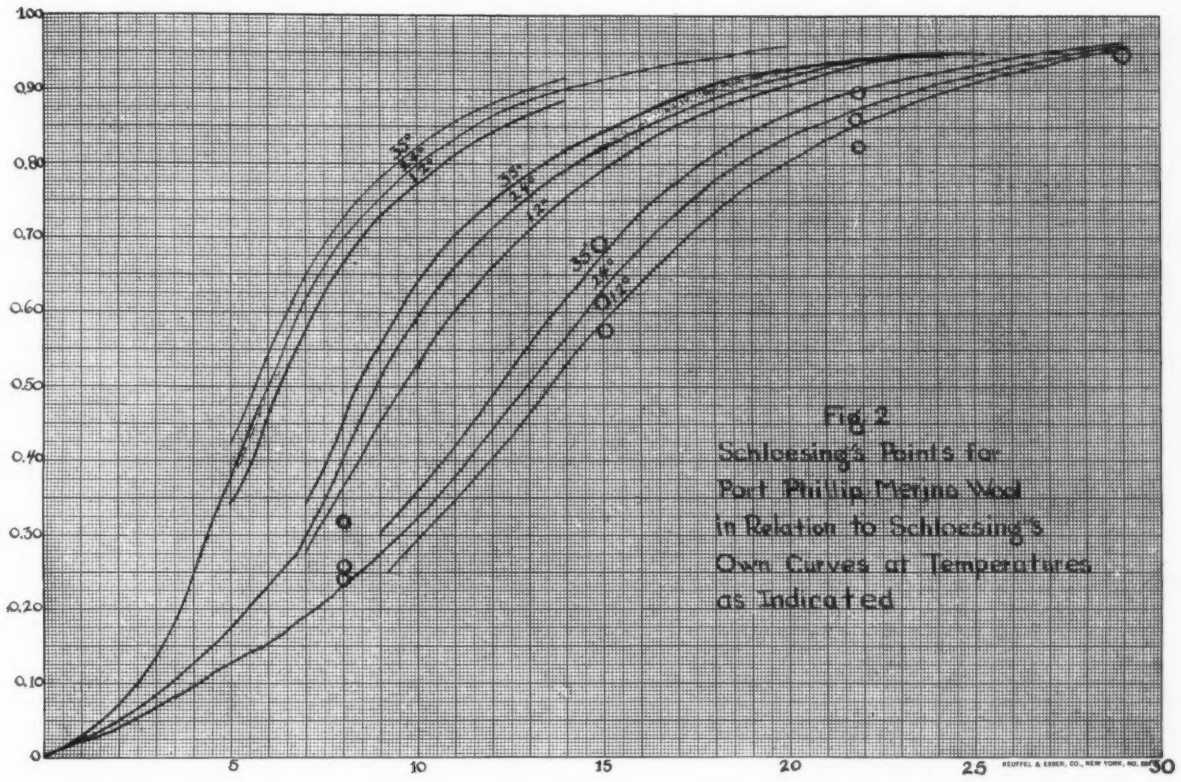
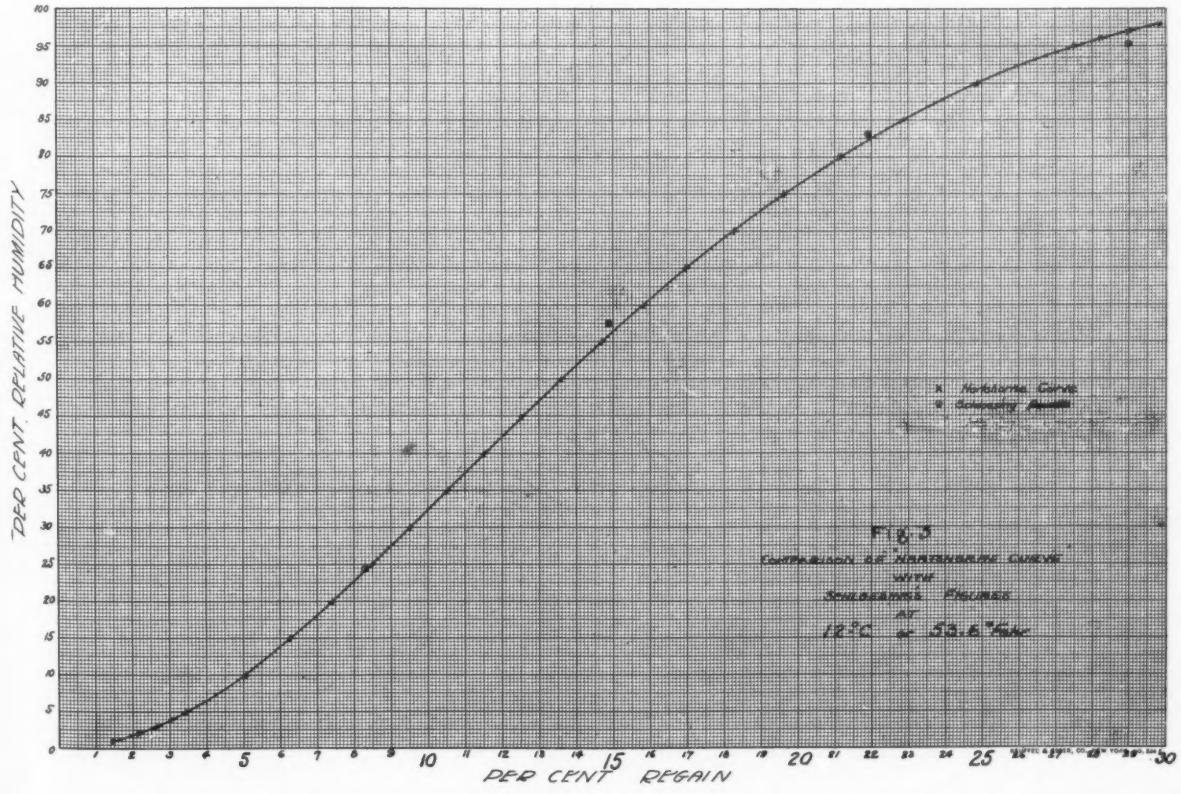


Fig. 2
Schloesing's Points for
Port Phillip Merino Wool
in Relation to Schloesing's
Own Curves at Temperatures
as Indicated


PER CENT. RELATIVE HUMIDITY
PER CENT REGAIN
Fig. 3

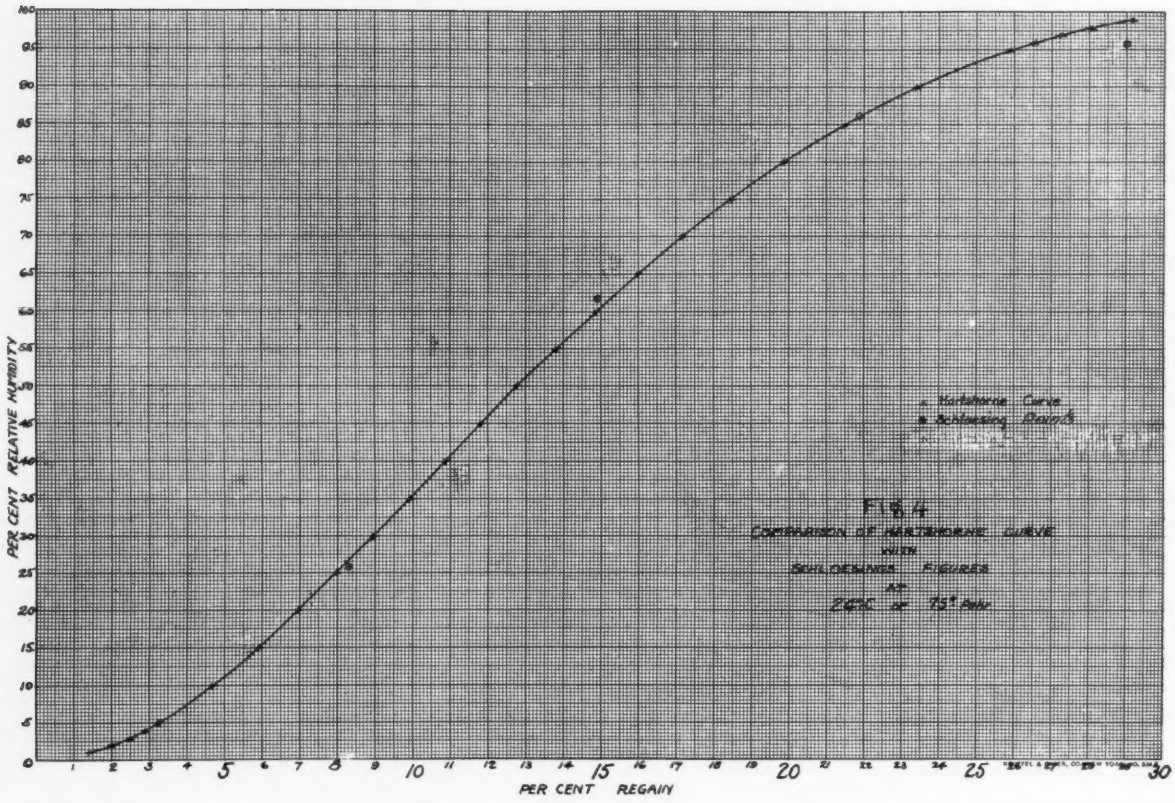


Fig. 4
Comparison of Hartshorne Curve with Schlossing Figures at 24°C or 75° Fahr.

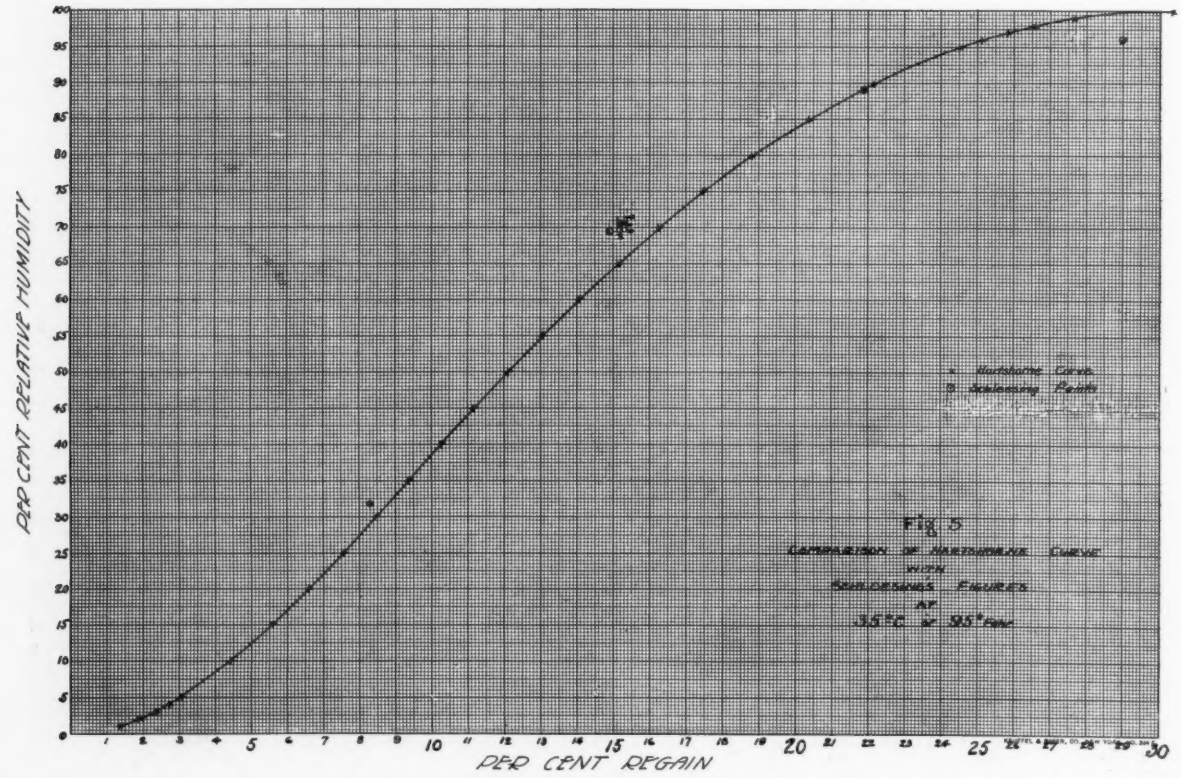


Fig. 5
Comparison of Hartshorne Curve with Schlossing Figures at 35°C or 95° Fahr.

nomena in moisture regain at the single temperature of about 22 deg. Cent. (approximately 70 deg. Fahr.) at 10, 35, 65, 75 and 90 per cent relative humidity on three kinds of cotton—Arizona, Egyptian and Peeler. He reaches his states of equilibrium by going in opposite directions at these humidities, pointing out that a slightly different result was obtained by the two methods of approach. He notes as follows: "It was found somewhat difficult to obtain concordant values for equilibrium moisture at saturation, owing to the partial condensation of vapor on the tube, and probably on the cotton as well. According to the data of Schwalbe and of Masson and Richards, the equilibrium moisture of cotton is 21 per cent at saturation." I assume that he refers to the same temperature at which he has been operating, which was 22 deg. Cent. (about 70 deg. Fahr.). My figures for Sea Island cotton are 20.6 per cent for 100 per cent humidity at that temperature. This was so striking a coincidence and so strikingly at variance with what Schloesing[3] had had to say for any of the three cottons which he examined at saturation point that my interest was at once aroused, and I take pleasure in commending Mr. Fuwa's whole article to my English critic as tending at least to show that I had good ground for believing Schloesing's figures are too high above 90 per cent humidity, "particularly on cotton."

In conformity with this general thought and as Dr. Shorter seems especially interested in wool, I have had constructed, from my data on combed Australian merino, curves corresponding to the temperatures 35 deg. Cent., 24 deg. Cent. and 12 deg. Cent. (53.6 deg. Fahr.), with an accompanying table of co-ordinates used. (See Table A.)

On and alongside of these curves are placed the points given by Schloesing as tabulated herewith. (See Table B.) These curves and points speak for themselves. (See Figs. 3, 4 and 5.)

So far as Dr. Shorter's connection with this subject is concerned I might close the comparison here, but for our mutual benefit and that of an interested public I will call attention to the fact that Dr. Shorter's curves, as shown in his article, are, by his own admission, taken at third hand; that is, in a note he gives his authority for the curves in these words: "The results plotted are taken from the Manchester Chamber of Commerce testing house reprint of the Textile World Record paper[1]—the only work accessible to the lecturer." Of course, the points which he attaches to

[3] Schloesing gives the following saturation figures at 24 deg. Cent. for three kinds of cotton experimented with by him: American, 32.8 per cent; Egyptian, 33.2 per cent; Indian, 30 per cent.

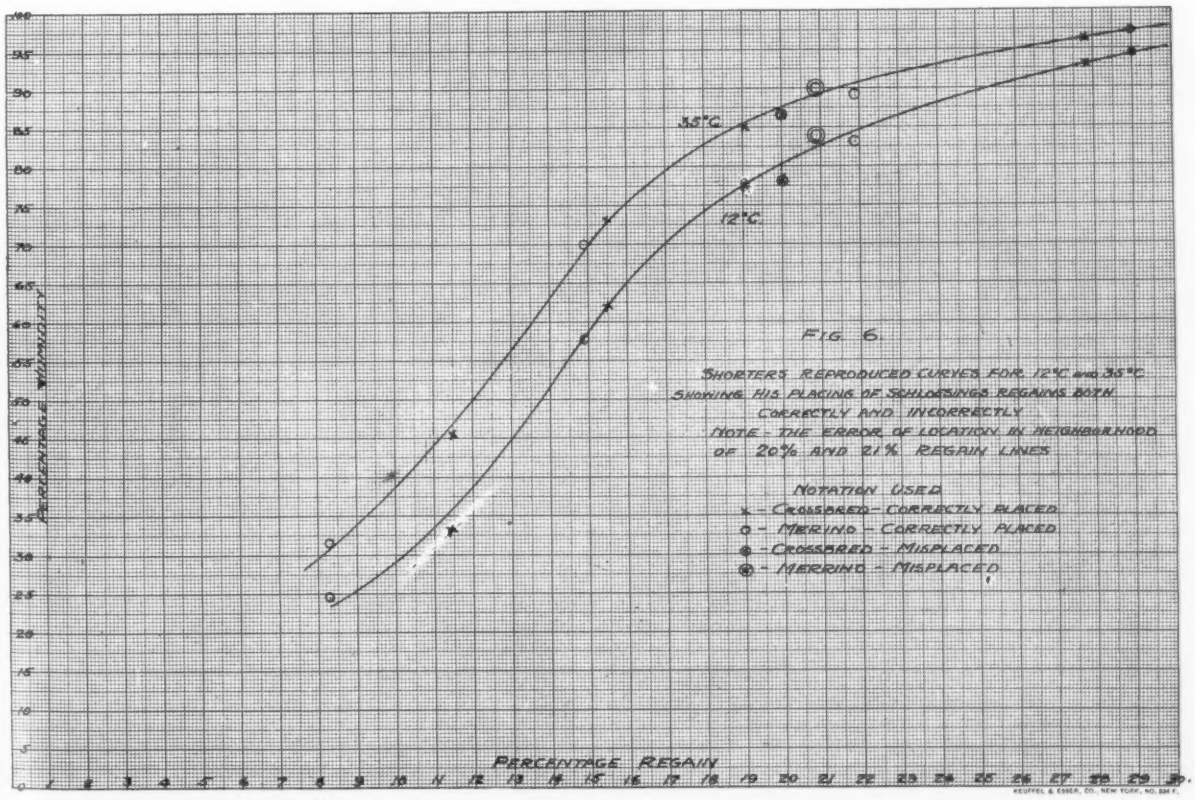


FIG. 6.

SHORTER'S REPRODUCED CURVES FOR 12°C and 35°C SHOWING HIS PLACING OF SCHLOESING'S REGAINS BOTH CORRECTLY AND INCORRECTLY

NOTE - THE ERROR OF LOCATION IN NEIGHBORHOOD OF 20% AND 21% REGAIN LINES

TABLE A

Hartshorne's Data for Combed Merino Clean Wool Regain Curves At

Temp. H%	12° C. R%	24° C. R%	35° C. R%
1	1.49	1.40	1.33
2	2.13	2.00	1.89
3	2.64	2.49	2.35
4	3.06	2.88	2.72
5	3.42	3.23	3.06
10	4.99	4.69	4.44
15	6.28	5.90	5.59
20	7.41	6.97	6.60
25	8.48	7.97	7.55
30	9.51	8.94	8.46
35	10.52	9.90	9.37
40	11.53	10.85	10.26
45	12.55	11.80	11.17
50	13.60	12.79	12.10
55	14.68	13.80	13.06
60	15.81	14.87	14.07
65	16.99	15.98	15.13
70	18.27	17.18	16.26
75	19.64	18.47	17.48
80	21.15	19.89	18.82
85	22.86	21.49	20.34
90	24.88	23.40	22.14
95	27.54	25.90	24.51
96	28.22	26.54	25.12
97	29.00	27.27	25.81
98	29.83	28.06	26.56
99	31.02	29.18	27.61
100	34.07	32.04	30.33

TABLE B

Comparison of Schloesing's Regain Figures on Combed Port Phillip Merino Wool with Hartshorne's at Same Conditions

Temp. ° Cent.	H%	Regains — Schloesing	Regains — Hartshorne	Diff.
12	24.5	8.3	8.38	+0.08
24	25.8	8.3	8.13	—0.17
35	31.8	8.3	8.79	+0.49
12	57.5	14.9	15.38	+0.48
24	61.8	14.9	15.22	+0.32
35	69.4	14.9	16.12	+1.22
12	83.1	21.9	22.04	+0.14
24	86.3	21.9	21.88	—0.02
35	89.2	21.9	21.84	—0.06
12	95.4	29.0	27.82	—1.18
24	95.7	29.0	26.27	—2.73
35	96.1	29.0	25.19	—3.81

these curves cannot be on the copy from which he takes the curves themselves, and the inaccuracy of their plotting shows lack of care by someone. The misplacement of both the crossbred wool figures and the Port Philip figures in the neighborhood of the 20 per cent regain line is obvious. (See the actual regains as given by Schloesing in table herewith and their correct placing on the reproduced curves, Fig. 6.)

To go back to Schloesing's original work, to which, evidently, Dr. Shorter did not have access, Mr. Dale, the translator, has very kindly loaned me the French document as published by Schloesing in 1893, showing in much detail what Schloesing had said and done up to that time, including two sets of curves on a good-sized scale. (See Figs. 1 and 2.)

Now comes the question: How did Schloesing produce his own curves and how closely do his curves correspond to his own figures? There is nothing stated in his article as to how these curves were developed. The only mathematical equation which he shows is one for finding the relative humidity of the air passing through his apparatus. Figs. 1 and 2 are reproductions of Schloesing's two sets of curves, on one of which he gives the three temperatures under consideration and on the other only one—the 24 deg. Cent. Note particularly the location of his own figures for Port Philip wool at 8.3 per cent regain, 14.9 per cent regain and 21.9 per cent regain, as shown on Fig. 2. From this it looks very much as though a free-hand sketch had been used to illustrate only the tendency of the curves rather than to represent their exact locations, notwithstanding the fact that "exactness" is what everybody likes to attribute to Schloesing.

Now comes the very interesting fact that when my curves are used (Figs. 3, 4 and 5) and Schloesing's tabulated regains for combed Port Philip merino are plotted against them, they appear to fit my curves more closely than they do his own, up to 90 per cent humidity.

This is not said to disparage Schloesing's work but rather to show that such discrepancies as need accounting for occur only at the very highest humidities. For these an adequate explanation (in my favor), it seems to me, is given by the interesting work of Tyler Fuwa, a careful scientific investigator.

What bearing the modern colloidal theory of matter may have upon the subject I leave for others to discuss.

Mr. and Mrs. S. R. David, of Boston, sailed from New York January 22 on the steamship Empress of Britain for a month's cruise, visiting the West Indies, Panama Canal and the northern coast of South America.

The Bleaching of Cotton Piece Goods

Part II

Boiling—Mercerizing—Damages in Mercerizing—Chemicking—The Chemic—Washing—Conclusion

By WILLIAM F. DEADY

The length of time required in boiling may vary in different bleacheries, according to the type of kier and the grade of goods boiled. In most cases it will be found that the major part of the work is done in the first two or three hours of boiling, but if the goods were taken from the kier after this short time they would be found to be more or less unevenly boiled, because the liquor has not had a chance to complete its action. However, if the circulation in the kier was such that each and every fiber was exposed to the same amount of liquor at the same time, from two to three hours would be sufficient, but as this is not the case, from eight to nine hours are usually required. The boil is a very important step, because the success of the succeeding operations depend largely upon it. If the goods are not bottomed well, the bleach will be irregular and much trouble in the form of resists will appear when the goods are dyed or printed. Of course, with white goods one has more of a margin, as the defects of the boil are not so noticeable, but in dyeing, especially pad dyeing, if the goods are not thoroughly absorbent, the smallest defect will show up, generally causing the goods to be stripped and reboiled, then redyed. This tenders the goods as well as increasing the cost of finishing.

Mercerizing

It might be well to add a few words on mercerizing at this time. Mercerizing consists of passing the goods through a strong caustic solution and stretching them under tension on a tenter frame to give them luster. There are several methods in use in different bleacheries. Some mercerize in the gray before boiling, by simply wetting out the gray goods on a water mangle and then running them through the mercerizing range; others boil the goods first, and then mercerize wet. Another method is to boil the goods, dry them, and then mercerize. This latter method is more expensive but gives the best results. Some goods are mercerized after bleaching, which gives excellent results; but great care must be taken in this method lest the goods become dirty or spotted with oil, in which case they require a reboil and bleach. This, of course, is the most expensive method. Mercerizing in the gray before boiling is the cheapest method. The caustic which remains in the goods after leaving the mercerizing range aids in the saponification of the cotton waxes during the boil. Very good kier boils result from this method, because the goods are evenly saturated with caustic before entering the kier. However, the class of goods one is handling should determine which method to use.

When mercerizing goods to be dyed, great care should be exercised to keep the temperature and strength of the caustic constant and, if goods are mercerized wet, to keep them evenly saturated; otherwise they will not be mercerized evenly, and uneven mercerization will produce uneven dyeing, because a full mercerized fiber absorbs more dye than a partially or unmercerized fiber. Also, one has to be careful about getting the proper width on the frame; too much pulling will damage the goods, and goods not pulled wide enough will be damaged on the finishing tenter frames when the finisher tries to pull them out to width. When mercerizing very light material, such as very fine organdies, etc., it has been found better to first singe them and run them through a steam box from the singer to extinguish any sparks, then directly to the mercerizer. This prevents fraying to a great extent. Silk and cotton mixtures may be mercerized in the same way, except that when the goods leave the wash boxes of the mercerizer they are immediately run into a sour box to neutralize the caustic soda, and then washed carefully. Otherwise the silk will be injured.

Much damage in mercerizing is due to the fact that the frame is so arranged that great tension is caused to act on both the warp and filling threads at the same time. With goods made of loosely spun yarns this does not have so bad an effect as with goods made from tightly spun yarns, because the individual fibers have more freedom to slip by each other in the former, while when tightly spun the fibers are twisted together and, being in a swollen condition from the caustic solution, do not yield readily to the pull; then, when the elastic limit is reached they break—generally along the selvedge, but occasionally in the middle down the whole length of the frame. Also, if the tenter clips are nicked or otherwise in poor working condition they will cause much damage to the selvedges.

Many damages caused by conditions mentioned in the foregoing paragraph may be remedied by placing an equalizing tension bar between the squeezer rollers and the entering end of the frame, and a similar bar between the delivery end and the wash boxes. Individual motors drive the pad and the frame so that the tension can be controlled. This arrangement allows most of the pull to act on the filling threads. The warp threads get well stretched going under and over

the guide rolls in the caustic saturator and through the nip rolls of the squeezer pad.

Near the delivery end of the frame the cloth is treated with several sprays of hot water, the object being to wash as much of the strong excess caustic out of the goods as possible before the tension is released, so that the width may be retained after the cloth leaves the clips.

After leaving the mercerizing frame the goods are washed thoroughly by passing them through several wash boxes, clean hot water entering the last box and overflowing into the next box, etc. This wash water contains considerable caustic, and in a plant having several mercerizing ranges it pays to recover the caustic by evaporation. In a small plant this will hardly pay, as the cost of recovery is as great or greater in many cases than the caustic is worth. However, much of this wash water could be utilized in making up the kier liquors. In determining the strength of these kier liquors the writer cannot too strongly recommend the use of titration with acid of known strength, rather than the use of the hydrometer.

Chemicking

When the goods leave the kier they should be free from the natural waxes and pectic matter which surround the fibers, but they still retain organic and mineral coloring matters which the caustic does not destroy. In order to remove this coloring matter the goods are subjected to the oxidizing action of sodium hypochlorite. This oxidation process either converts the colored compounds into colorless compounds or renders the insoluble colored compounds soluble.

One of the most efficient methods of carrying out this process may be outlined as follows: The goods leaving the kier are run through a washer similar to the one previously described, to wash out any loose dirt and soluble matter remaining in the goods. With some classes of goods it is necessary to sour after this washing, and then rewash before bleaching. In most cases, however, if the goods have had the proper previous treatments the gray sour may be dispensed with.

The cloth leaving the gray washer is squeezed, passed up over a reel and dropped into a rectangular vat containing the sodium hypochlorite solution, where it becomes impregnated. It is then run through a set of squeeze rolls to remove the excess liquor. This squeezer is placed directly over one end of the tank opposite the end where the goods enter; the excess liquor which is squeezed out flows back into the tank. From here the cloth runs over a reel and into a piling machine similar to the diastase piler. No housing is required for this piler. As the chemic attacks wood and gradually softens it, a lining of sheet asbestos, which will withstand the action of chemic, is advised to prolong the life of the piler and to prevent oxycellulose being formed where the cloth comes in contact with the oxidized wood; the side boards of the squeezer may also be of asbestos boards.

The size of the piler is determined by finding the proper length of time the cloth has to lay after saturating with chemick before the hypochlorite breaks up and oxidizes the coloring matter; build the piler to hold sufficient cloth to allow that time to expire. The method of making the chemic will play a great part in the time required for it to break up. If the chemic is made by allowing chlorine gas to act on sodium hydrate a chemic is produced that is slow in breaking up. Sodium carbonate chemic will act much quicker and the more neutral it is the quicker will be the action. Therefore, sodium carbonate is recommended.

Two of the most efficient methods of making the chemic may be outlined at this point. First, make a strong chemic solution and pipe it to the chemic saturator, where it is diluted with water to the proper strength; this strength is maintained while the wet cloth runs through by regulating a valve on the strong chemic pipe, allowing sufficiently strong chemic to flow in to replace that taken out by the cloth. This strong chemic may be made up in the proportion of one part chlorine to three parts sodium carbonate. A very small amount of caustic soda may be added to keep the chemic thus made from deteriorating too rapidly in the storage tank.

A second and better method is to make the chemic at the saturator as the cloth passes through, by combining sodium carbonate solution and chlorine under pressure, and allowing it to flow through an expansion coil within the saturator. Of course, this latter method will require a more intelligent operator than the former. The chemic made in this manner can be made almost neutral and is much more active than that made in the former method.

An ammeter recording instrument may be used in connection with the former method (as the alkali is constant and can be used as an electrolyte) to record the amount of current passing through the solution between two electrodes. This, of course, is not absolutely accurate, but is sufficiently so to give a practical idea of the strength of the chemic at all times. Chemical analysis must be resorted to in the latter method.

The strength will vary with the class of goods handled. After the saturation, the goods are allowed to lay in the piler until bleached, which requires about one hour. As the goods leave the piler the bleacher can determine whether or not they have been bleached sufficiently. Of course, goods to be dyed do not require such a full bleach as white goods, and one run through this unit generally suffices. However, in some cases it may be advisable to give white goods a second run.

On leaving the bleaching piler the goods pass through a small washer constructed similar to that mentioned in a previous paragraph. Here the excess

(Continued on page 74)

Proceedings of the American Association of Textile Chemists and Colorists

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THIRD ANNUAL MEETING

SATURDAY AFTERNOON SESSION

December 8, 1923

In concluding his paper on "Vat Dyes: Their Properties and Varies Phases of Their Application," George K. Hannah, Jr., offered the following "Topics for Discussion":

1—Piece Goods Dyeing with Vat Colors

Since the advent of the vat dyestuffs back in the year 1901, the object of many textile chemists and dyers has been the devising of methods of application of these products to cotton piece goods, at a reasonable cost and with assurance of large production of first-class dyeings. At the present time methods and machinery for the processing of goods with this type of colors are still being developed in the technical application laboratories of the American vat dyestuff manufacturers, and some of the largest textile finishing plants in this country.

To date enough progress has been made by the textile chemists and dyers who have been engaged in solving this most difficult problem to enable the selling houses of these textile finishing plants to guarantee the fastness of their fabrics to many of the color destroying agencies met in every-day wear, such as soap and boiling, perspiration and uric acid, sun and weather. These dyestuffs are applied at present by four different methods, as follows:

First—Pad method. Second—Pad and jig method. Third—Jig method. Fourth—Pad and continuous machine.

When applying these colors with the pad method, the dyestuff is reduced with caustic soda and hydrosulphite and sodium sulphide to assist in penetration and preservation of the dye bath.

After being padded with the reduced dyestuff, the cloth is run through five or six rope washers consecutively, in which it is oxidized, washed, and developed and washed; then it is mangled and dried.

When applying these colors by the pad and jig method, the goods are first padded with an alkaline solution composed of a carrying or thickening agent, such as dextrine, gum tragacanth, or gum arabic, a hygroscopic and penetrating agent such as glycerine, and the unreduced but finely divided dyestuff.

The cloth is padded in this solution containing the dyestuff in suspension; then it is taken to the jig, where the dyestuff held in suspension on the cloth is brought into its leuco state by being passed back and forth eight or more times in a solution containing caustic soda and hydrosulphite, and in some cases a small amount of glue; the bath, of course, being heated to its proper temperature for reduction of the dyestuff.

The cloth is then oxidized, washed and developed either in the jig or in the rope washers, similar to the pad method.

When applying the vat dyestuffs by the jig method, the cloth is given eight, ten or more ends through the leuco compound of the dyestuff, which has been prepared with the necessary caustic soda, hydrosulphite and other assistants, at the proper temperature. When the desired shade has been obtained, the cloth is oxi-

dized, washed and developed either in the jig or rope washers, mangled and dried.

When dyeing by the pad and continuous machine method, the cloth can be dyed in a padder containing the reduced dyestuff, made up same as first method, then passed over a set of skying rollers for oxidation by the air, then through a multiple box washing and soaping machine, the first box containing the oxidizing solution, second and third cold running water, the fourth the developing bath of soap, and the fifth and sixth boxes containing hot running water. After which the cloth is mangled and dried.

The cloth may also be dyed by the pad and continuous machine process by padding with the dyestuff in suspension as made up in the second or pad and jig method, then passing through the multiple box washing and soaping machine, the first and second boxes containing the caustic soda, hydrosulphite and other assistants to reduce the suspended dyestuff to its leuco-compound on the fabric, then passed up into the air over a skying frame to be air-oxidized, then down into the third and fourth boxes to be washed with cold running water, into the fifth box for development with soap, and washed with hot running water in the sixth and seventh boxes, then mangled and dried.

2—Mechanical and Chemical Control of Vat Colors on Cotton Piece Goods

Mechanical Control

When dyeing on the padder, the nip and squeeze must be corrected by proper adjustment of the weights and levers; the rolls must run true and their surface must be perfectly smooth, otherwise the goods are liable to be streaky, and seconds produced from the formation of bad selvedges.

Several types of padders are used in this country for the application of vat dyestuffs, such as the type in which the cloth is firmly held against a spray feed pipe by a traveling apron, and then enters the rubber-covered rolls; and the type where the lower roll is almost totally submerged by the dye liquor which is contained in a cast-iron shell which fits closely around the bottom roll, the dyestuff being sprayed into the back of this iron shell.

In Central Europe a special type of padder is used for dyeing piece goods with vat dyes, which consists of a water-jacketed wrought-iron trough, into which the cloth enters and is submerged by two rolls, and then passes up between two rubber rolls which, instead of being set, as is usual, one above the other, are arranged in a slanting position, forming an angle of about 45 degrees, the lower roll being almost wholly submerged in the dye liquor, while the upper roll is slightly submerged and the surface of the liquor is just below the contact line for squeezing.

Each of the aforesaid arrangements of padders has for its primary object the elimination of the formation and deposition of scum on the fabric and the consequent flecking of any preoxidized dyestuff onto the cloth.

Owing to difficulty encountered in obtaining good penetration on the pad, this method is suitable for only light-weight material and the dyeing of tints.

Heavy grades of material and medium and heavy shades are best dyed on the jig.

Only pure sodium hypochlorite bleached cloth, which is free from acid, alkali and any traces of lime, chemic or iron, must be used, and the bleach must be uniform.

When dyeing on the jig, the cloth must run as straight as possible, all bowed ends must be avoided, and while making additions to the dye bath the rolls must always be kept in motion so the dyestuff cannot settle in the roll unevenly.

Chemical Control

The main difficulty in dyeing vat colors on pieces is to prevent uneven and premature oxidation and to keep the dye bath in a perfectly reduced state.

No strict rules as to amounts of caustic soda and hydrosulphite required will hold good, as this depends on the amount and strength of dyestuff used, grade and quantity of the material to be dyed, and in jig dyeing the number of ends or passages through the dye bath the cloth may require to obtain the desired shade.

A large excess of caustic soda gives dull dyeings, and a large excess of hydrosulphite causes uneven exhaustion of dyestuff, while a large excess of both caustic soda and hydrosulphite retards the exhaustion of the bath, with resulting light dyeings.

With each addition of reduced dyestuff it is best to make a slight addition of hydrosulphite to the dye bath and care should be taken to keep the dye bath just alkaline enough to suit the particular type of dyestuff being applied.

3—Effect of Hard Water on Vat Colors

The dyestuffs of the Anthracene group are very susceptible to hard water containing lime and magnesium salts, but those of the Indigoid and Carbazol groups are apparently not seriously affected by this condition.

Water containing slight permanent hardness can be used if it is first well stirred with an adequate quantity of sodium carbonate and the white precipitate which

forms is allowed to settle, the clear water only being used for dyeing. But water containing much permanent hardness must be treated by one of the artificial zeolites in a suitable softening apparatus before it can be used with assurance of satisfactory results.

Water containing much permanent hardness is not suitable for dyeing the Anthracene group of vat dyestuffs, as the lime and magnesium salts it contains form insoluble lakes with the dyestuff and many of the soluble oils used as assistants in the dye bath.

Algae and free iron also react unfavorably with most of the vat dyestuffs, but more especially the Anthracene series.

President Olney—We have had many papers presented in various journals in regard to vat dyes, but I am sure you will all agree with me that up to the present time we have had no exposition of the subject which has been as complete as this one by Mr. Hannah. We are very much indebted to him for giving us this paper to-day, and for the vast amount of time which he must have put into the preparation of it.

This whole subject is a very broad one and one which I believe is well worthy of discussion, and we will endeavor not to curtail on the discussion of this subject. In the last number of the Proceedings there was an account of a symposium on vat dyes held in New York, and a number of the men are here who took part in that and I think they are well qualified to discuss different phases of the subject. We should be pleased to hear from them or from anyone else.

Dr. L. A. Pratt—Mr. Chairman, I should like to ask whether any chemical tests have ever been made use of in determining the excess of hydrosulphite in the vat?

G. K. Hannah—Yes, there is a method that was published in the Journal of the Society of Dyers and Colourists. I don't remember just which copy it was in but I can find out for you. I am sorry I don't happen to remember it.

Dr. Pratt—Is it valuable at all?

Mr. Hannah—I have never used it myself because it was only recently published. Of course, I am a demonstrator on the road and I am generally quite busy and therefore don't have much time to try out those things.

President Olney—Are there any further questions or remarks?

O. H. Forsdale—I should like to ask the speaker what is the advantage of using the padding continuous machine over the straight padding machine.

G. K. Hannah—I would rather have men who are doing that work discuss that, if they care to. Of course, you can only do the lighter tints on the continuous machine, but with the padder, of course, you have to do your heavier shades and your heavier materials. With the continuous machine you would have, of course, increased production. In other words, when the piece goes through the one process it is finished. In the other case you would have to pile up your materials on your trucks and then carry them over to your other machines for oxidation, developing, washing and drying.

O. H. Forsdale—The reason I asked that question is because I wondered if it was possible to pile up a large amount of material in trucks after the goods had passed through the padder without some danger of oxidation on the edges, and so forth.

Mr. Hannah—Of course, when you are doing work on the padder you can dry the material previous to developing or oxidizing if you prefer. But in the other case, with the goods that are padded in the reduced state, if you have skying apparatus, you will have no difficulty, any more than you have with chain warps. I have never experienced any.

Mr. Forsdale—Then I understand it would be necessary to dry the goods after they are put through the padder or before they are reduced.

Mr. Hannah—It is preferable.

President Olney—Are there any further questions or remarks?

A. L. Lustig—I would like to ask the speaker whether he can tell us more about the process used on the Continent of padding with unreduced color dry and then developing in the alkaline bath and finally scouring?

Mr. Hannah—That would come under the second method I mentioned. You see, in that case you use the gum, a small amount of alkali or caustic and, of course, your dyestuff which has been previously stirred up with the dissolved gum and a penetrating agent like glycerine. Then the material is padded. There is no hydrosulphite there, so you don't have any reduction. After that you can either dry them or let them set. Then take them to the jig and develop them.

Mr. Lustig—This is done continuously.

Mr. Hannah—In that case, I think the last process is used—the continuous method. You see, your first bath would be the padding bath with the gum and no hydrosulphite, then going down into the first and second boxes containing the hydrosulphite and more caustic soda, which would reduce the dyestuff, forming the leuco-compound; then the cloth goes up into the air over the skying arrangement and is oxidized by the air; then it goes down into the next box containing the acid, and perhaps a metallic salt like bichromate, to be sure you have perfect oxidation.

A. L. Lustig—This process I refer to is not a hydrosulphite process at all. I believe the dyestuff and sulphate of iron or a similar compound is used for padding, the goods are dried, then run through the alkaline bath; it is all done very easily and excellent results are ob-

tained. Dark colors, however, cannot be obtained from this process. I have seen the actual work in two plants in Germany. The point is that the dyestuff and part of the reducing agent—in this case sulphate of iron—are padded onto the cloth, then it is run through a rather large tank with caustic soda, washed and scoured, and it is all done. But that is for light shades only. I thought that might interest some of the members here.

G. K. Hannah—I am not familiar with that.

President Olney—Is that process being used in this country?

Mr. Lustig—It is being used on the other side. I don't know whether it is being used on this side. Perhaps it is. However, it is quite commonly used on the other side.

President Olney—Can anyone here give any information about that?

Mr. Carter—I think I can throw a little bit of light on that. The first way of printing vat colors was to print them in conjunction with ferrous sulphate, and I think there were tin crystals and perhaps there was a little tartaric acid. The cloth was then dried and passed through caustic soda warm at about 125 to 130 deg. Fahr.

Evidently the process Mr. Lustig has spoken about is something that has been gotton up from that original printing process. It came out with the first Indanthrene Blue and it wasn't received with very great joy by printers; they all looked forward to having a lot of trouble with it.

President Olney—Was it successful as a printing process?

Mr. Carter—Yes, they used it at that time because there was nothing better, but some of them used it, but I think only to a limited extent. Then as soon as the hydrosulphite came out, I mean when they got the ordinary Blankit, so-called, or hydrosulphite, they switched onto that. But in regard to padding, I have handled a number of light pieces in that way; the padding solution was made up of Indanthrene, some caustic soda and sufficient ordinary hydrosulphite to reduce it, and then the hydrosulphite formaldehyde, as it was called then. The light shades were padded through that, then dried over the cans, the first few cans being lapped, oxidized, washed and so forth. That ran pretty satisfactorily at that.

In regard to the remarks made about Scotch tubs for warp, my experience with that wasn't a very happy one. It didn't work very well, and I got far better results from using the rectangular warp dyeing machine. The thread-up of that changed it from the perpendicular to horizontal so that the warps came down, but ran horizontally.

Those machines were made to take about 400 pounds of warp per set, which would be four chains, each doubled down to 750 yards. The heating coils were at the side of the machine. That worked very well. We got better results with that than from the round Scotch tub.

Henry J. Thompson—Previous to the war we had a compound in this country—a dissolving salt called benzyl sulphanilate of soda—that was used in printing vat colors and assisted in dissolving vat colors in such a concentrated case. I would like to ask Mr. Hannah if he has had any experience in using that compound in either of his first or second methods for applying the vat colors in such a concentrated solution to piece goods in the interest of getting more level dyeing.

Mr. Hannah—I have not made use of it. I have always figured that it was more suitable for printing work so I haven't tried it for piece dyeing with vat colors.

President Olney—Has anyone else had experience with that compound that he is willing to discuss?

Mr. Thompson—Sometimes it is necessary, to correct an offshade or an uneven shade, to strip the vat dyes. I had a little experience in doing that sort of work. If anyone is interested, I have samples of various vat colors that were stripped from piece goods, and I will be glad to show them.

President Olney—Is there any further discussion?

G. K. Hannah—Mr. President, I would like to ask the last speaker how much can you strip off the piece goods or the material with this stripping process? There has always been difficulty in obtaining a good strip for vat colors.

H. J. Thompson—I haven't a supply of all the different colors that might be used, and all of them don't strip to a pure white. If you can see it from there, on the right-hand side of that card is a dyeing and on the left-hand side is the dyeing stripped. You will notice that some of them are stripped to a pure white; others are stripped to a pale tint: in all cases, however, it is from a dark shade. The top one is Indanthrene Violet 2R; the next one below that is Indanthrene Red 2BN; the one below that is Helindone Pink BN; the one on the top card is Algol Brown R stripped to almost white. The next one is a combination with Indanthrene Blue GCD; the second one from the bottom is Indanthrene Blue GCD with Dark Blue BO; the lower one is Indanthrene Blue GCD and Indanthrene Yellow G.

I spoke of piece-dyeing. Here is Indanthrene Pink B double—not a very hard color to strip, to be sure, but you can see what has been done and it might save a lot of seconds if you did do that and recovered your goods by a subsequent redyeing. Here is another compound shade of an orange and Ponsol Yellow. It doesn't strip to a pure white but it strips sufficiently so that you can redye it.

Here is our friend Indanthrene Blue GCD double again. It isn't stripped entirely but in most cases sufficiently to redye it to any desired shade. And here is

Indanthrene Violet BN with Indanthrene Red RRN—a combination of shades. Here is a combination of Indanthrene Blue GCD and Anthraflavine GC. That is not as good as the others.

G. K. Hannah—Mr. President, I would like to ask the gentleman if he has had any experience in stripping chain warps such as are dyed in Scotch tubs?

H. J. Thompson—Experience in that line has not been very great; it has been more in the skein yarn. It would be possible to do that; however, it would make a little more of the reducing agent necessary, as it does with the dyeing, to prevent oxidation.

C. H. Forsdale—I would like to ask the speaker if he has any objection to telling us how he does strip those.

Mr. Thompson—Absolutely not. I have a formula on this card that I used.

I boiled it for three to five minutes in a 2 per cent caustic soda solution and then added 3 to 5 parts of sodium suiphoxylate formaldehyde, per a hundred parts of liquor. I continued the boiling until the color was thoroughly reduced and then added one to two parts, depending on how much I wanted to bring it down, of what was formerly called Lancotrope W, now made and sold in this country. I know of only one, named Indopon W. It is the sulphonated salt of dimethyl phenylbenzyl ammonium chloride—rather a complicated compound. I added one to two parts of that compound. I boiled it for ten to fifteen minutes, longer if necessary, then I neutralized, usually with acetic acid, and washed thoroughly.

C. H. Forsdale—In connection with the piece goods, do you do that on the jigs or the padder?

H. J. Thompson—It doesn't make any difference. You get more efficiency if it is not done on the jig because of the oxidation going back and forth. If you keep it under the liquor all the time you will do better. (Applause.)

President Olney—Is there any further discussion? If not, we will continue with our business meeting for a while. There was a committee appointed consisting of Mr. Lustig, Mr. Livermore and Mr. Wood to draw up a definite statement in regard to that motion that was put this morning. I don't know that they are ready to report, but I would suggest if they are not that this Committee get together so that we can have their report a little later. And now we will be pleased to hear from the tellers.

Giles Low—There were 212 votes returned out of something over 400 originally sent out—one to each active member. Of these we had to discount 16 for the reason that they didn't carry the names of the senders as was requested. Of these, 14 voted for three vice-presidents so they couldn't have been used in counting for the vice-presidents. However, even if these extra 16 had been used it wouldn't have made any difference in the result.

For President there were 210 for Professor Olney.
For Vice-President:

Mr. Livermore	159
Mr. Cady	125
Mr. Wood	103

For Secretary, Mr. Hadley—210.
For Treasurer, Mr. Durfee—210.

For Councilors, Messrs. Robbins and Moran each 210. (Applause.)

President Olney—You have heard the report of the tellers, and according to the Constitution I assume that there is nothing further for me to do than to declare those mentioned as elected. However, I wish to express my thanks to the members of this Association for the vote they have given to me. I appreciate it very much. As I have been President of the Association for two years, I thought it was about time that I withdrew and gave someone else an opportunity, but I was told that the Constitution was so written that that seemed impossible (laughter); that a man couldn't withdraw very gracefully until he was nominated and after he was once nominated his name had to go through the mill. So there was little left for me to do, but I trust that when the time comes for nominations in another year that you will consider someone besides me. There are altogether too many worthy men in this Association who would make excellent presidents, and it is time they had an opportunity to try the office out and to contribute toward the development of the Association.

Mr. Fisher—I think it would be a great mistake to drop a man when he is making good as well as you are and I hope that that will not be done. (Laughter and applause.)

President Olney—You have heard what I have to say. Notwithstanding what Mr. Fisher says, I hope you will keep me in mind rather than Mr. Fisher when the time comes. (Laughter.)

Our next paper is "Dyeing of Sulphur Colors on Silk," by Dr. R. E. Rose. (Applause.)

DYEING SULPHUR COLORS ON SILK

By Dr. Robert E. Rose

Members of the Association: The subject against my name on the program is "Sulphur Colors on Silk." I am going to talk a little bit away from that in order to make intelligible the real point that I wish to bring home. If I had been allowed to call my paper, "The Advantage of Having a Good Road Map," it really would have been more to the point.

The advantage of fast colors, of course, has always

been apparent to the manufacturer in competing with other manufacturers. The advantage has also been apparent to the user of colors, but only since the war has the tremendous push on the part of the final user of color become what it has. And this push has passed beyond the stage of demanding fast colors on cotton or fast colors on wool and gone to a requirement for fastness on silk, quite unexampled before the war when silk was considered a fabric so beautiful that it might be evanescent and the colors evanescent too.

We, in our laboratory, as people interested in the application of color, have given the subject a great deal of thought. We have investigated methods and have found something which is really worth while.

I must speak of rather more than sulphur colors on silk in order to make myself clear. I want to start with vat colors on silk because that was the historical development with us of this investigation.

To go back before the war the dyeing of the vat colors on silk was a very tricky operation; in fact, some of the colors were not recommended at all for this purpose. It occurred to us that it might be of advantage to treat the matter simply as a physical-chemical equilibrium, to get away from the thought of the dyer and see what we could do to improve conditions, and to overcome the difficulties.

As a physical-chemical equilibrium, the dyeing of vat colors is really very complex. That is why I have to have the blackboard. I used to be a teacher, and a teacher must have a blackboard, you know. (Laughter.)

We start (point 1 on our chart) with our paste or powder in the solid condition, and let us assume that we add water or an aqueous solution to the paste. Then we have the dyestuff itself—and that dyestuff can exist in three conditions. As soon as the water comes in contact with it, if it is dry, it can be suspended as solid matter in the ordinary sense; it may be in colloidal subdivision, which is much finer than the ordinary solid; or it may be in solution. Presumably, all three conditions are correct so we have solid, colloid and solution. (See chart.)

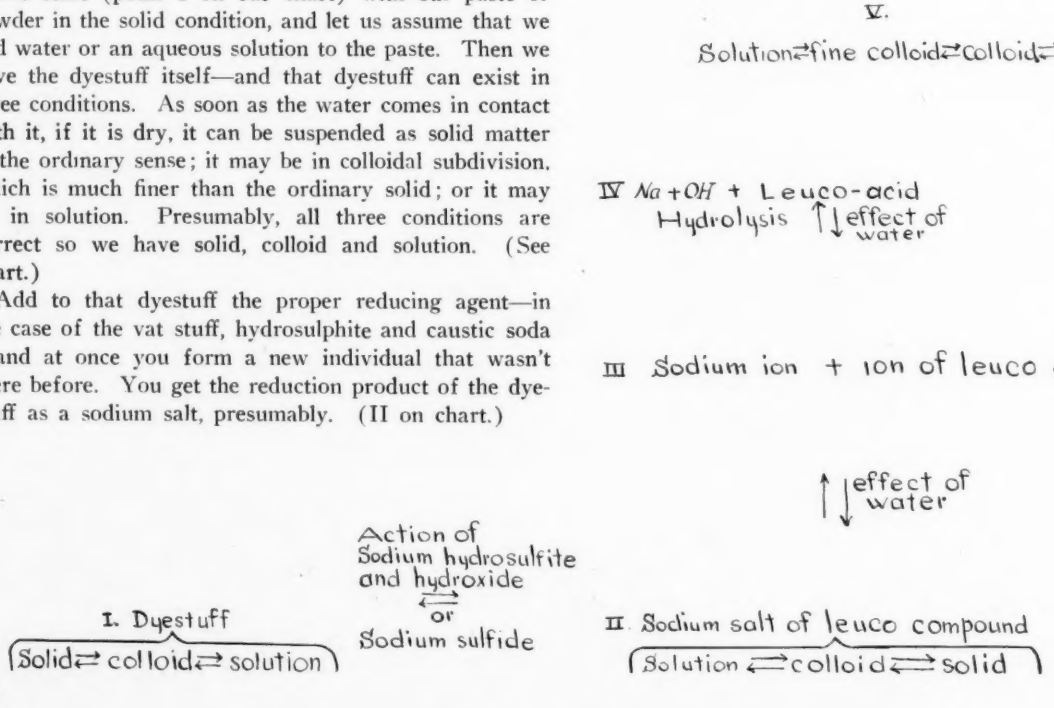
Add to that dyestuff the proper reducing agent—in the case of the vat stuff, hydrosulphite and caustic soda—and at once you form a new individual that wasn't there before. You get the reduction product of the dyestuff as a sodium salt, presumably. (II on chart.)

Sodium salts are fairly soluble as far as we can ascertain but they can be salted out, so again there is a possibility of this compound existing in the three forms of the original dyestuff, an equilibrium between colloid and solution, or even actual solid.

A sodium salt refuses to stay in solution as such. Water acts on it and it ionizes; it forms sodium ions. So you have another equilibrium (III on chart) giving rise to the sodium ion and leuco-compound ion. But remember that the leuco acid of a vat dyestuff is a very, very feeble acid. We all know that the salts of very feeble acids when they ionize in solution, undergo hydrolysis; the water acts on them. In this case this results in the formation of caustic soda and the leuco acid itself. The leuco acid (IV on chart) isn't very soluble; it can exist as a solid, a colloid, or as a solution. That is about the scheme as we figure it out and that was our road map.

Mr. Hannah said a few minutes ago that if you have too much caustic the vat color won't go on. That is obvious enough. If you get too much caustic at this point, IV, you force the equilibrium backward to III and II; if you get too much very soluble sodium compound it won't go onto the fiber. You must have something less soluble.

Suppose we study this in connection with silk. The nature of the fiber necessitates our cutting down the caustic here, IV, in order to save the silk, but if we cut down the caustic it inevitably follows that hydrolysis will increase and the leuco acid will come out as a solid.



It might be possible to change the nature of the reduction product and affect the equilibrium, but that is practically hopeless. What can be done? The leuco-compound must be allowed to come out of solution and yet it must be kept in a condition in which it will dye; the only way to do that is to keep it in a very finely colloidal suspension. The emphasis then must be this stage here (V in chart)—if we can we must keep the leuco acid there. That calls for a protective colloid. The old method was to use glucose which really isn't a protective colloid in the proper sense, but makes the solution so viscous that it interferes with the little particles getting together and forming lumps. You understand, of course, that the moment the lumps get too large you get no dyeing, the vat doesn't stand up. We tried out a great many assistants and finally we struck upon one that seemed almost ideally adapted to giving us most remarkably excellent results.

If I may go back a moment, we found it was best to cut the alkalinity here (at IV) with sodium bicarbonate, but, of course, that produced a condition under which the vat would decompose. The protective colloid that we found best adapted to our purpose was boiled-off liquor—a bast soap. This is a typical colloidal suspension and as such it has a remarkable tendency to keep up the colloidal particles of the vat dyestuff, so much so that if you use it you will find you get very pleasing, clear dyeings. The silk retains its soft feel and doesn't become harsh as it is too apt to do if you have to use alkali at all, and the whole process is so easy to operate that one has no difficulty. The balance is maintained by emphasis then on this point.

A typical operation is the following:

For 100 pounds silk make a vat with 25 pounds Ponsol Blue GD Double, using 35 pounds of caustic soda and 30 pounds hydrosulphite, that is, a much higher proportion than is commonly employed of these two substances. When the color is fully vatted, add 45 pounds of sodium bicarbonate with constant stirring. This bicarbonate neutralizes the greater part of the caustic soda, converting it into carbonate. The acid liberated from the hydrosulphite takes care of the rest. The vat is now ready for the addition of 8 gallons of boiled-off liquor, or bast soap. The weight of the bath should be about forty times that of the weight of the material. The silk is entered at 120 deg. Fahr. and dyed for three-quarter hour. It is lifted, wrapped and whizzed. The silk is then washed, soured, soaped and scrooped in the usual manner. It should be noticed that the quantity of bicarbonate should be adjusted by the alkalinity of the bath, which is tested with phenolphthalein paper. This reagent must show a pink reaction and not red before the bath is ready.

Let me go over to my real subject—sulphur colors. The equilibrium in this case is identically the same except that instead of hydro and soda here, sodium sulphide is the reducing agent; that is, except for those sulphur colors that can be vatted with hydrosulphite and dyed on silk.

The reduction is made with sulphide, and the old methods call for cutting the alkalinity of the sulphide by the use of bisulphite of soda. However, as soon as the alkalinity is reduced the leuco-compound is going to settle out, or at best the bath is going to be hard to manage, the sulphur colors being worse than the vat colors. The dyeings produced are streaky; the baths simply won't hold up.

We tried in this case what we had done before, putting in a protective colloid and using the one we had found so successful in the case of the vat colors, bast soap. That improved our dyeings very considerably.

The problem, though, wasn't solved, because even with this some of the dyestuffs remained hard to apply; the results were very streaky. We went back to our program here to see where we could find another point of attack. This, the protective colloid (V), was exhausted.

Instead of hydro we are using sodium sulphide for reduction, and the chemistry of sodium sulphide in relation to this problem is important—sodium sulphide acts as a reducing agent because it produces hydrogen in the presence of an alkali (the alkali coming from the hydrolysis of the sulphide). But anyone who will take the trouble to look up the properties of hydrogen sulphide will find that it is an extremely poor reducing agent either in a neutral or an acid medium.

Two things then occur when the alkalinity is reduced with bisulphite: the caustic is being removed until there is every chance of the solid leuco-compound coming out, and also the reducing agent is being removed, because hydrogen sulphide isn't a reducing agent as soon as neutrality is approached.

Therefore, it seemed to us that at the moment of removing the reducing power of the hydrogen sulphide we should substitute some other reducing agent, and we hit on the plan of neutralizing with a mixture of 75 parts by weight of bisulphite and 25 parts by weight of sodium hydrosulphite. Hydrosulphite will act in a neutral or acid medium. Actually, this mixture works like a charm. Any sulphur color can be dyed by this process, which may be illustrated by the following typical formula:

For dyeing 100 pounds of silk, make a solution of 10 pounds Sulphogene Green 4GX, a sulphur dyestuff, in the usual manner, with 10 pounds of sodium sulphide concentrated; that is, chip sulphide. To the liquor thus produced add a mixture of 75 pints by weight sodium bisulphite, 25 pints by weight sodium

hydrosulphite, preferably in solution, in a small quantity of cold water until the bath becomes but slightly alkaline, giving only a pink, and not a red, when tested with phenolphthalein paper. This will require about 12 pounds of the mixture of bisulphite and hydrosulphite. Add 8 gallons of gum or bast soap and make up the bath to 400 gallons, or about forty times the weight of the silk. Raise the temperature of the dye bath to 110 deg. Fahr., and at that temperature enter the silk. Bring the temperature very slowly and regularly to 160 deg. Fahr. within one-half hour; hold at this temperature for twenty minutes, then add 50 pounds Glauber salt and dye for one-half hour longer. Pass the goods through a squeeze roller into cold water, then into hot water. Soap at 150 deg. Fahr. for fifteen minutes and finally scroop, as usual, with an acid.

I know that the silk dyer looks with great dismay on the notion of introducing sulphur colors on silk at all. Perhaps they will have a very limited applicability, but the dyeing can be done, and can be done successfully, leaving the silk with all its luster and its beauty. One feature of using this protective colloid is that the dyeings are kept bright. They don't go dull, as is only too apt to be the case in even a faintly alkaline bath.

I have some dyeings here to illustrate the result that can be obtained. These were put together hastily and in overenthusiasm a couple of scarlets were put in there that are neither vat nor sulphur colors. I don't claim we have any sulphur colors as bright as that yet. (Laughter.) But this is a card made up with the vat and sulphur colors arranged according to their coloristic values. You see, here we have the very light yellows and the browns—the sulphur colors mostly—and then here we have the sulphur blues and the vat blues, mixed up pretty well—black vat colors and black sulphur colors.

I hope that what I have told you will make you feel as we did: that drawing up a chart like this of any operation where you can see the real detail helps very greatly in understanding and bettering one's processes.

I should like to state that the credit for this work should be given to Frank L. Remlein. Thank you. (Applause.)

President Olney—It is very interesting to hear about this process of applying sulphur colors to silk. For many years, of course, attempts have been made to apply sulphur colors to wool. Better results, however, have been obtained with silk, but for the most part they have not been satisfactory, and if a process can be worked out along this line, with due precaution and care as Dr. Rose has described, I should say it would be of considerable value to the silk industry.

It is possible that Dr. Scott may be able to add something to this discussion.

Dr. W. M. Scott—I don't know that I have anything of a very constructive nature to add to Dr. Rose's remarks. I think that his remarks are certainly very illuminating in themselves, and I believe there is a much larger field than we perhaps at first thought there could be in the application of sulphur colors to silk. We have worked on a number of the methods that Dr. Rose spoke of as being in vogue, with varying success, but I think that possibly with the suggestions he introduces we may attack the problem with a fresh enthusiasm to obtain, perhaps, better results than we have formerly.

I am certainly very much indebted to him for his talk on the subject.

President Olney—Is there any further discussion or any other questions?

Mr. Carter—This has certainly been a very interesting talk that we have listened to from Dr. Rose, and one that I think we can very well take to heart and consider a good deal.

While we are on the subject I thought perhaps it might not be amiss to tell some trials I made of silk with sulphur colors in another way, from which I got some very nice results.

In making up the dye bath I took the sulphur color, the sodium sulphide, a small amount, perhaps 1 per cent, of soda ash and glucose; so the color was reduced. Then to the dye bath I added the molecular equivalent of the sodium sulphide of ammonium chloride so that I got then ammonium sulphide and, of course, sodium chloride. And I got some very nice results from dyeing up silk in that way, with practically the substitution of ammonium sulphide for the sodium sulphide. That is applicable chiefly on sulphur blacks. The shades were nice; the silk looked soft and bright, and I thought at the time that was something worth following up. (Applause.)

A. R. Thompson—Along the line of dyeing the wool and the vegetable fibers with sulphur colors, or silk and vegetable fibers, I am doing a little work now in applying sulphur colors with hydrosulphide and sodium sulphide and combinations of each. By that method I have produced effects which in some cases—although they are not common—are very interesting.

I have found in dyeing the ordinary sulphur blue, for instance, if you dye it with, say, hydrosulphite alone, with the maximum amount of alkali that it is possible to use, as the dyeing proceeds to the end, if you want to have the silk darker than the cotton, you cut down the PH value by adding such compounds as ammonium sulphate or sodium bisulphite, and the color is thrown

more onto the animal fiber than it is onto the vegetable fiber. Then you can do the same thing by adding more soda ash to favor the cotton; or you can dye them both alike by striking an arbitrary medium and having the proper PH value to dye both fibers alike.

It is very possible to do that and I have samples to show, that I have worked on. (Applause.)

President Olney—I think probably the committee we appointed earlier is ready to report, and if so we will continue our business meeting for a while.

W. D. Livermore—Mr. President, I have two reports to make.

This morning we were speaking of the fastness tests that have already been tentatively published, and after a conference with Dr. Killheffer and also Mr. Wood, we are of the opinion that it is desirable to add to the fastness tests already published, in the case of fulling, scouring and so forth, and such tests as are purely of technical interest to mill men, a rather definite statement of the way in which the standards were dyed for the tests. In regard to the material, however, as this particular line of test is of interest only, or principally, to the technical chemists, it is presumed that each technical chemist will have to use the material in which he is interested.

In regard to such tests as are of public interest, particularly fastness to light, fastness to perspiration and similar lines, it is the belief of some of the members of the Society at least that a standard fabric on which these tests can be made should be quite specifically designated.

I would like to ask Mr. Wood if my statement is substantially as we agreed.

P. J. Wood—It is correct.

W. D. Livermore—In regard to the committee headed by Mr. Lustig and on which I am officiating as secretary, we offer the following resolution:

It is recommended that the Research Committee take suitable means to obtain the co-operation of the various interested organizations with a view to establishing such acceptable standard fastness tests as are of interest to them. The Committee have particularly in mind the United States Bureau of Standards, the National Association of Finishers of Cotton Fabrics, the National Association of Converters of Cotton Fabrics, the Silk Association of America, and any or all of the various associations of wool manufacturers, the Laundryowners' National Association and the United Waist League. (Applause.)

President Olney—You have heard the motion as presented by Mr. Lustig this morning, which was duly seconded, and which has been revised and completed somewhat. Is there any discussion of this motion?

. . . The question was called for.

President Olney—Are you ready for the question?

Hugh Christison—Mr. President, I would like to know if Mr. Livermore could tell us a little more definitely what they expect us to do. Are we simply going to ask these various organizations to co-operate with us, or how is it intended we shall approach them?

W. D. Livermore—I don't think the Committee went so far as to consider the modus operandi of our consulting these gentlemen, but I do think that the intention distinctly was that their attention should be called to the fact that we were working upon these tests, and that we would be glad to have co-operation or suggestions from them. If I am not right, I would like to have Mr. Lustig answer further.

A. L. Lustig—That is right.

W. K. Robbins—Mr. Chairman, as there may be some here now who were not present this morning, might it not be well for the Chairman to state the motion that we are voting upon, as long as this Committee has reported? I confess to a little bit of confusion in my mind.

President Olney—We are voting on the motion as read by Mr. Livermore. That takes the place of the motion presented by Mr. Lustig this morning. Is that right?

Mr. Livermore—That is correct.

G. A. Moran—I think that it is quite desirable for us to co-operate with these other organizations. While in certain cases—as in the case of the fastness to fulling—the test concerns only the manufacturers of goods, most of the other tests, as the test for perspiration and the test for washing and soaping, concern the users of the goods more than they do the manufacturers, and we have up to the present time considered them practically only from the manufacturer's point of view.

In order to get the point of view of the people who are using the goods and who are most concerned, I think that we should necessarily co-operate with the people who deal with the public and sell the goods and who come in contact more intimately than we do with the difficulties that are met with by the users of the goods. And in dealing with these people we can get a good many suggestions that may be of value that we have not considered.

We have, however, to a certain extent co-operated with the Laundry Owners' National Association, in drawing up the test on fastness to washing. We had on that Committee a representative of the Laundry Owners' National Association. So that we have had to that extent co-operation, but I think we will gain considerably by securing the co-operation of other organizations.

Further than that, these tests will not be of much value unless we interest the people who are going to use the goods later on, and in order to get them interested we must obtain their confidence in the fact that the tests will be satisfactory to meet their requirements.

Dr. E. H. Killheffer—Mr. Moran, I think, has men-

tioned the really important thing, and that is to secure the very widespread recognition of the tests as official. That is the point I had in mind this morning. Whether you want to handle it as an amendment to the motion itself or not makes perhaps little difference, but I would suggest that it be included, and that the matter then be left to the Council's discretion as to the modus operandi of the thing. But the important thing is that the message be given to these other associations that there is now a competent body—the most competent, if you please—to deal with these subjects, and that it is for that reason we invite their co-operation and hope they will see their way clear to co-operate with us.

President Olney—Do you care to add that to your motion?

W. D. Livermore—That's all right.

President Olney—It will be easier perhaps to add that to the original motion rather than put it as an amendment. All those in favor of the original motion, with the addition as suggested by Dr. Killheffer, will please say "aye," contrary-minded "no." It appears to be a unanimous vote.

We are now ready for the paper entitled "The Use of Monel Metal in the Bleachery and Dyehouse." The International Nickel Company, of course, are more widely interested in this metal as far as its promotion is concerned than any other organization, but all dyers and finishers in recent years have come in contact with Monel metal used in one way or another and that use is constantly growing. We thought it would be well to present the matter at this meeting.

I have just had two cards handed to me with names on them, Thomas M. Bowen, E. A. Turner and R. J. McKay. I am not certain as to which one of these gentlemen is to give the talk. May I be straightened out in regard to this?

R. J. McKay—The paper was written by Mr. Turner and myself, and I will deliver it.

We have some slides which will perhaps make this paper a little more interesting.

I am practically a stranger to your organization. Therefore, I have prepared a little introduction which tells something about the International Nickel Company and what we are doing.

I may say before beginning the paper that it has been of a great deal of interest to me personally to hear your discussions on co-operative research. I am vitally interested in the research of our own company, and co-operative research programs, we believe, are the most valuable of any research programs.

It has been reputed among other bodies that the dyers and finishers of textile materials are not the best of co-operators, but I may say that in our work with them we have found them to be the best co-operators. In co-operating they always have sense enough to retain their own business to themselves, which I believe, after all, is the secret of co-operation. (Laughter.)

MONEL METAL FOR DYEING, BLEACHING AND FINISHING EQUIPMENT

By R. J. McKay and E. A. Turner

[*Note—About fifty lantern slides were shown in connection with this paper. A few of the illustrations covered by these slides are reproduced herewith.*]

The business of the International Nickel Company is the mining and refining of nickel and Monel metal. Its technical staff is principally occupied with problems connected with the metallurgy involved. In the finishing of sheets, bars and other shapes for the market our chemists and engineers must become somewhat familiar with problems of users of the metals. These problems are of wide scope, including, as well as dyeing and wet processing, the problems of the power engineer, pickling, galvanizing and tinning of steel, dairying, automotive engineering, food product handling, institutional kitchen design, surgical equipment manufacturing, power laundry machine use, coal mining and many general problems of chemical and allied industries.

Unfortunately, our contact with the textile industry is indirect, as in most cases we sell to equipment manufacturers, who in turn sell their fabricated product to the mill. Thus the problems of the dye and bleach house become known to us only when some difficulty is experienced in the use of Monel metal equipment. The general use of Monel metal in dyeing has gradually developed by years of experience. This development has not been impeded by any serious difficulties, and as a result our knowledge is principally of application without the detail of the involved processes.

Of recent years, technical development and industrial progress in the application of dyestuffs have been so rapid that we believe it is time to put more effort into research on the most efficient use of Monel metal in this field. Therefore, it gives us great pleasure to respond to the request of your officers to talk with you to-day, in the hope that it will stimulate co-operative study of the problems common to the Association of Textile Chemists and Colorists and metal manufacturers.

We feel that the present paper, perhaps, is not sufficiently bristling with technical information to interest you equally with the other papers of this session, but hope that the description of some actual applications will be a nucleus for your further thought.

In general resistance to corrosion we might roughly

place the better known metals in order, as follows: Platinum, gold, silver, nickel, Monel, tin, lead, copper, aluminum, zinc and iron. The cost of platinum, gold and silver naturally limits their application. Nickel has for many years been used for dyeing machinery in Europe, but until recently the wide sheets necessary for textile use have not been available in this country. Monel metal, next on our list, is an alloy, and in a sense should not be classified with the elementary metals. However, being a natural alloy as opposed to synthetic alloys, we take the liberty of including it. It has found wide favor in the textile industries, due to its similarity in properties to nickel, of which it contains some 67 per cent. In many properties, as we shall see, it is superior to nickel. Monel metal also possesses the advantage of being somewhat cheaper than nickel. By stating that it is a natural alloy we mean that the copper-nickel content of the ore is refined without separation or change in ratio. The resulting metal contains 67 per cent nickel, 28 per cent copper, the remaining 5 per cent of other metals. It is a white metal, stronger than mild steel, tough and ductile, rustproof and capable of taking and retaining the high polish of nickel. It is more resistant to corrosion than other commercial metals In addition to this valuable combination of properties, it has been well known commercially for many years. Monel metal price quotations appear daily in the metal papers, along with copper, brass, aluminum, zinc, etc.

Tin, next on the list, is a structurally weak metal and is used in the form of a coating or tinning on copper and steel, with the obvious disadvantage of the necessity for retinning. Copper has been used for many years, but there are a large number of shades that cannot be dyed in it satisfactorily. It is, of course, admirable for many purposes. Lead, like tin, is structurally weak, and equipment lined with the metal is heavy. In use the lead tends to buckle and creep. Lead is exceptionally resistant to sulphuric acid, but is readily attacked by organic acids and alkalies. Iron is used extensively for sulphur dyeing equipment, for which it is well suited.

From the description of Monel metal we go on to the factors which make it economical for the construction of dyeing and bleaching equipment:

1. It eliminates damage to goods from rust and other metal stains.

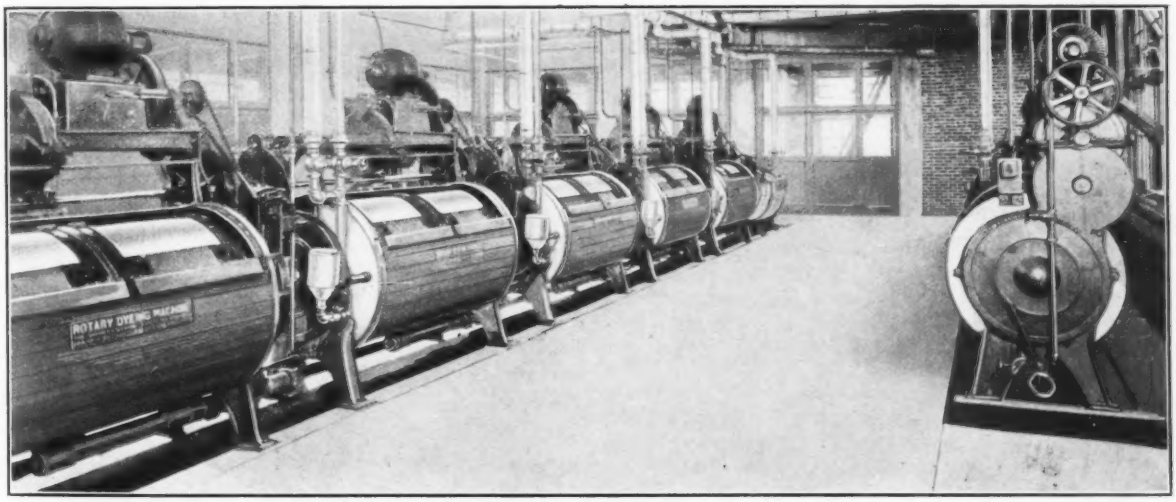
2. It lengthens the total life of equipment by its resistance to corrosion and abrasion, and prevents shutdowns for repairs.

3. Its strength and high fatigue resistance enable improved design of machinery.

4. It is conveniently cleaned, thus permitting frequent change of batches and efficient use of floor space.

Hosiery and Knit Goods Dyeing

Hosiery mill men were among the first to recognize the value of Monel metal and its use is now an old story to this branch of the trade. Practically every manufacturer of both the paddle and rotary types of machines is now employing Monel metal for the construction either of all-metal tubs and cylinders or wood tubs lined and fitted with Monel metal. Because of the large variety of shades which fashion now demands, metal machines have advantages over the



Gotham Silk Hosiery Company—Sectional View of Dyehouse Showing Batteries of Monel Metal American Rotary Dyeing Machines

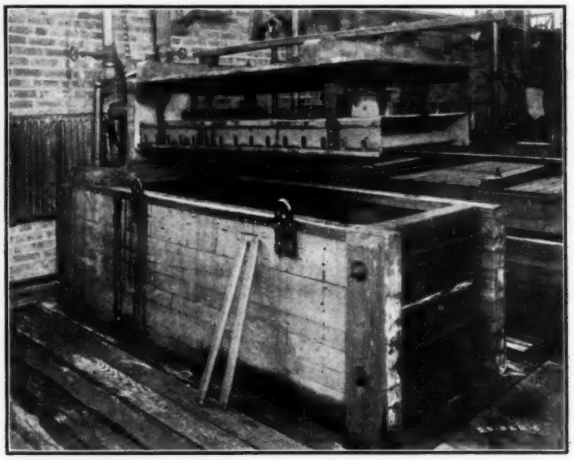
wooden machines formerly employed. A certain amount of color was absorbed by the wood machines, and when a new color was to follow much boiling out was necessary before another batch could be dyed. Frequently it was impossible to make the shade desired in the same machine. This necessitated the carrying of extra equipment and loss of time. Since Monel metal machines have come into general use in hosiery dyeing, the dyer can change from one color to another by giving the machine a good washing out, the addition of soda ash usually removing every trace of the previous color. In use, Monel metal equipment takes on a high polish and its surface affords no roughness or splinters to catch the delicate fibers of fine grades of silk hosiery. Such well-known brands as Gotham Gold Stripe, Holeproof, Notaseme, Phoenix, Radmoor, Butterfly, Cadet, Real Silk, Allen A and others are being dyed in Monel metal machines.

Those who were present at the last Knitting Arts Exhibition in Philadelphia must have noticed the universal adoption of Monel metal for hosiery and knit goods dyeing due to the above facts. During the last few years appreciation of the structural strength of Monel metal has been shown by increased use of all-Monel tubs as opposed to wood lined with metal.

Bleaching

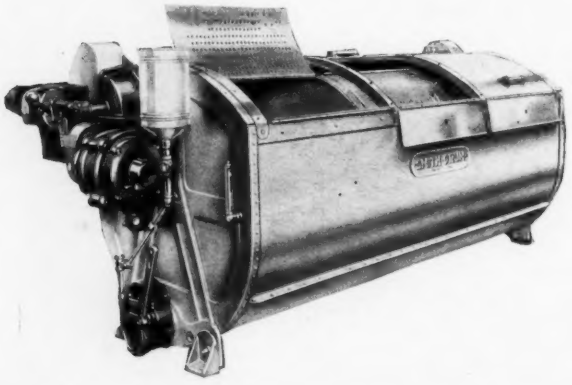
The same type of Monel metal machine as used for hosiery dyeing is used for bleaching and degumming all grades of silk hosiery. In addition, the other types of Monel metal equipment mentioned are suitable for bleaching.

Strong oxidizing power combined with chemical instability are properties characteristic of all bleaching agents, and they are probably necessary for the bleaching reactions. But any chemical compound which combines these properties is corrosive, and therefore corrosion problems are present in every bleaching process. These corrosive effects are so serious that the choice of equipment is practically limited to stoneware, wood or Monel metal. Metal equipment is desirable because of its ruggedness as compared with stoneware and its freedom from damage to goods by splinters as compared to wood. Monel metal is resistant both to the oxidizing agents used and to the alkaline solutions in the concentrations in which bleaching is done. Practically the only reagents which will corrode Monel metal are combinations in which a high hydrogen ion concentration exists, together with a strong oxidizing agent.



Hussong Dyeing Vat, Schlake Dye Works, Chicago. Tank Lined and Fitted with Monel Metal. Cage and Dye Sticks of Monel Metal Construction

In bleaching with peroxide bleach it has become common practice in many plants to mix in the bleaching tank by adding sulphuric acid to the water and then stirring in solid sodium peroxide to neutrality and later adding "stabilizing" agents. The best practice with Monel metal equipment is to reverse the order of the first additions, dissolving the peroxide first and adding acid to the neutral point. This practice has been worked out in co-operation with a prominent chemical manufacturer who makes sodium peroxide for the purpose. The reason for this modification is that the former method of mixing produces the combination of strong acid and oxidizing agent, which causes attack as mentioned above. The attack is so slight as not to damage the equipment, but it produces an undesirable colored precipitate and seriously weakens the bleach.



Monel Metal Rotary Dyeing Machine for Hosiery—Made by Smith, Drum & Co.

Another method much used in larger plants which operate several Monel metal bleaching tanks is to mix stock solution in a separate wooden tank, running it into the Monel metal tanks as needed for bleaching.

Bleaching with sodium hypochlorite made up by running liquid chlorine into soda or sodium carbonate solution is another method gradually meeting with favor. In this process Monel metal is used only for the bleaching itself, and not for the mixing. It is universal practice to mix in a concentrated solution, and the only materials which will hold this very active solution satisfactorily are glass and stone ware. Therefore, mixing is best done in stoneware and the strong solution later diluted in the Monel metal bleaching tank. In the same way lime bleaches are used in Monel metal only in the bleaching strengths, and not as concentrated stock solutions.

The presence of nickel in Monel metal has a tendency to catalyze the bleaching reactions, and therefore it is desirable often to use a slightly different formula in Monel metal from that used in wood. The reactions, as a rule, go more rapidly and bleaching may often be accomplished with a weaker solution. In many cases "overbleaching" will occur with Monel metal unless this is done.

Raw Stock Dyeing

The properties which make Monel metal useful in hosiery dyeing and bleaching apply to raw stock dyeing. The circulating type of dyeing machine, in which the dye liquor is forced through the raw stock by means of a pump, is frequently lined with Monel metal and valves, pump shaft, pump and cage are made of it.

The revolving cylinder type of raw stock dyeing machine largely employs Monel in its construction. The vat is generally of all Monel metal construction, as well as the cylinder which revolves half submerged in the vat. Usually the cylinder is equipped with about eight bars running from head to head, and these are often fitted with Monel metal hooks which pick and open up the stock as the cylinder rotates. Stock is lifted from the dye liquor and when the proper angle is reached it drops back into the liquor. The action of the hooks in handling the stock is similar to the old hand process of "poling" the stock.

Monel metal is extensively employed in the construction of the "submerged" type of revolving cylinder raw stock machine. As the name indicates in this case, the cylinder may be entirely immersed while in operation.

Hussong and Walker & Davis machines of the circulating type employ Monel metal for shafts, propellers, tie rods, bolts and nuts, washers, tank linings, and more recently for the construction of the cage itself. There has been a gradual increase in the use of Monel metal for such construction. The introduction of Monel bolts and nuts, then tie rods, washers, etc., led to the other uses.

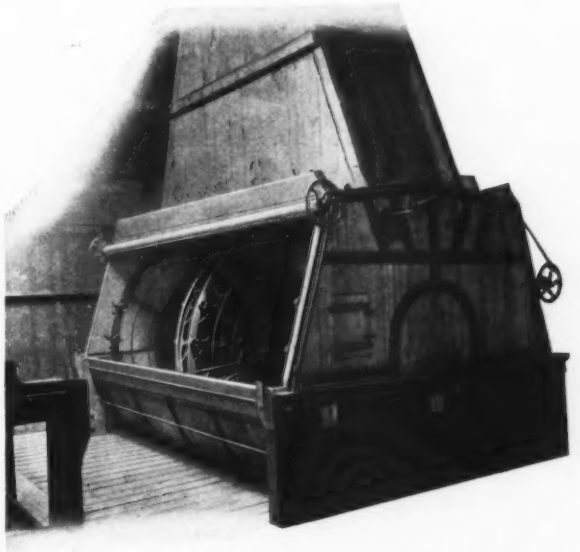
This same type of machine is also widely used for worsted top dyeing and with a yarn rack, and a raw stock cage, top, skeins or raw stock can be dyed in the same machine.

Raw stock is, of course, frequently dyed in open hand tubs and "poled." Monel metal tubs are used for this purpose and for dye sticks.

The "Hurricane" circulating dyeing machines for raw stock are fitted with Monel metal. Frequently the cage is of Monel metal and the tanks are Monel lined. Monel shafts and agitators are practically standard in this type of machine except where the machine is used exclusively on sulphur black when all iron construction is satisfactory. This type of machine is also suitable for saturating wool stock and rags in carbonizing. Monel metal very successfully resists the action of the strong reagents used.

Yarn Dyeing Machines

Beam dyeing machines, such as those manufactured by John Brandwood and Delahunty, are equipped with perforated Monel metal beams. The heads of beams are frequently lined with Monel to protect the yarn from iron rust, discoloration, and the possibility of tendering. In this type of machine warp and filling can be dyed in



Walker & Davis Skein Dycing Machine in Large New England Plant. Lined with Monel Metal

one operation, and when the beams or packages have been dyed they can be oxidized and dried by heated air being forced through the yarn under pressure.

In the Franklin process the keirs are often lined with Monel which is also useful for the springs on which the yarn is wound in the Franklin package or cheese dyeing machines.

The Klauder-Weldon type of skein dyeing machine uses Monel in both the non-hoist and hoist types. Also the carpet yarn dyeing machines where the acid resisting requirements are exceptionally severe. In one reel type of machine cast Monel metal spiders are used weighing several hundred pounds. These spiders vary in diameter, single machines having two and double machines three fitted on a shaft. The stars, cups and dogs used for rotating the sticks are often of Monel and constitute a good share of the business of foundries specializing in the manufacture of Monel metal castings for the textile industries. Monel metal ferrules on the ends of the sticks are an economy as the wear is greatest at this point. However, many are now using all Monel metal sticks made either from the drawn welded Monel metal tubing now available or in the square form made from sheet metal by lock seaming. As a reference, the Consolidated Textile Catalogs will cover these uses of Monel metal.

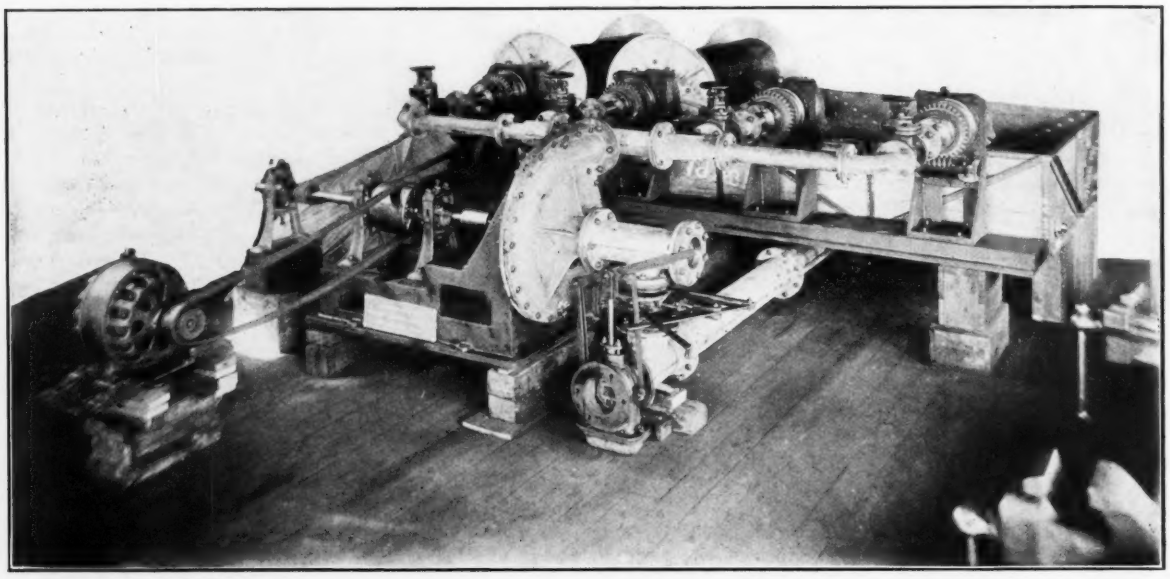
The Monel metal circulating type of dyeing machine for skein yarns such as the "Hussong," "Hurricane" and Walker & Davis types are similar in construction to those used for raw stock dyeing except for the cage which is frequently entirely of Monel and fitted with Monel metal sticks for suspending the yarn, braid or tape. In the Hussong machine Monel metal shafts and propellers are standard and in other makes it is extensively used.

It is interesting to note that practically every carpet manufacturing plant in the country is equipped with this type of machine using Monel metal shafts and propellers and fittings, and in many cases for tub linings and fittings. Before installing new equipment the Toronto Carpet Company, for instance, made a series of tests over a long period of time. Their findings were such that they have since put it to many uses.

The Giles skein dyeing machines are of the reel type, and as far as Monel metal construction goes they are similar to the Klauder-Weldon type, except that the Giles machine employs a tub of all Monel metal welded construction rather than the wood tub with Monel lining. Flat Monel metal springs are used in connection with the reel.

Piece Goods Dyeing

Jiggers are widely used for the purpose of dyeing goods in the piece, and Monel metal is gradually being applied for the all-metal rolls and for the gudgeons and fittings of wood rolls. Many mill owners are lining their wood tubs with light gauge Monel metal sheet, and in the case of new jiggers are having the cast iron frame support a heavier gauge Monel metal tub. This is good economy, for in piece dyeing the product handled is



Four-beam Monel Metal Bleaching Machine with Monel Metal Tank, Pump, Shaft, Impeller and Perforated Beams —Made by Delahanty Dyeing Machine Company, Pittston, Pa.

costly, having been through many manufacturing processes, and stains must be avoided.

The same reasons apply to the use of Monel in padders where metal rolls are used in contact with rubber covered rolls.

The technical laboratories of the Du Pont Company are equipped with a number of jigs and padders lined and fitted with Monel metal. The director of these laboratories is well pleased with the results from dyeing in this equipment. It is significant that Monel metal is used in these laboratories where the Du Pont dyestuffs are standardized.

In compartment dyeing machines Monel metal is suitable for linings, fittings and rolls.

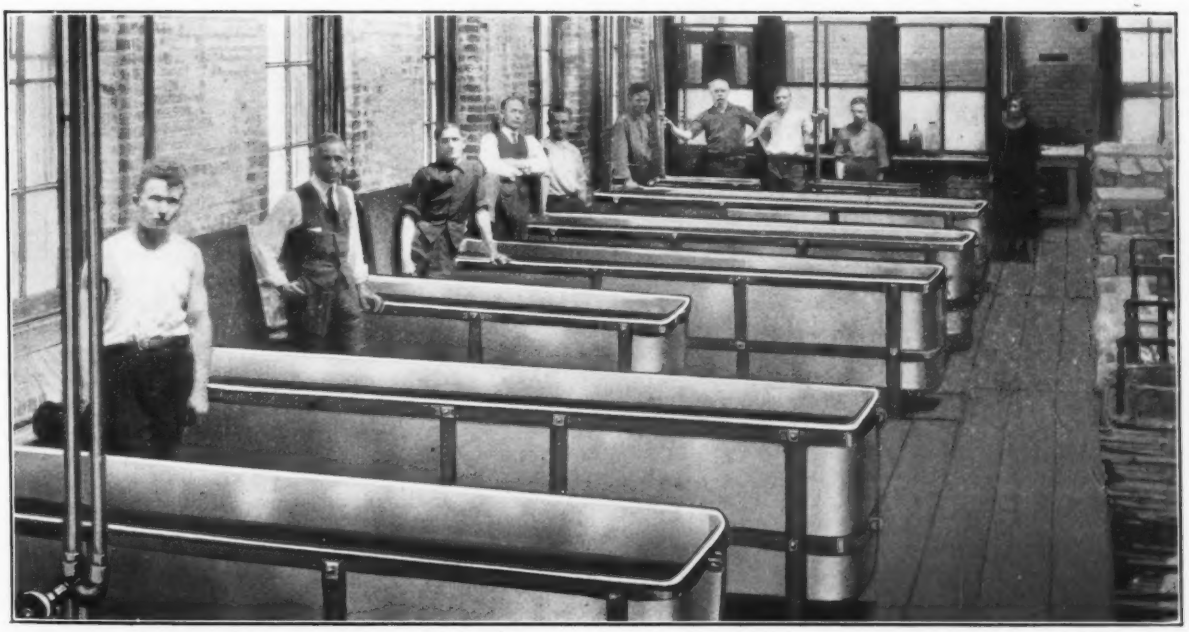
Reel machines, perhaps more than any other type, are used for dyeing piece goods both in the string and in the open width, particularly for woolens, worsteds, felts and pile fabrics. Modified types are used for knit underwear, Jersey cloth, silks, cotton dress goods and shirtings. In machines of this type Monel metal has a variety of uses. Perhaps the best known use is for tie rods, nuts and washers on the wood tubs. However, it is also used for self supporting tubs, for linings of wood tubs, and for washouts or drains. Several types of these plugs and seats in Monel metal are available. These will be referred to in our discussion of tanks. Monel is also extensively used for the gudgeons and fittings of wood rolls and for all metal rolls. Many dye houses are now having the wood tubs of their reel machines lined with Monel, and a number of manufacturers are making up Monel metal linings ready to slip into the tub. Monel is also being used for the perforated partitions, and in the form of tubing and fittings for heating coils. Manufacturers of temperature controlling equipment note an increased demand for Monel metal bulbs to be used in connection with their apparatus.

When equipped with Monel metal the reel type of machine is instantly ready for dyeing any shade and bleaching, scouring and rinsing can be carried out in it when necessary.

The Morrison oval reel type of dyeing machine is frequently lined with Monel, and the reel itself covered with Monel. These machines are used for dyeing silk in the piece and the smooth surface prevents damage to fine goods.

The mercerizing process, employing as it does the use of caustic soda and acids for neutralizing, is a logical use for Monel metal. Although the manufacturers of such machinery are not using Monel to any great extent except for bolts and nuts, the mills themselves are wide awake to its possibilities. Monel metal, with its strength and property of withstanding the action of caustic, is suitable for the rolls used in skein and warp mercerizing.

The replacement by Monel metal of upper parts of machines for spraying the fabric with acetic acid pre-



Textile Silk Dye Works, Philadelphia, Pa.—All Monel Metal Dye Barks Used in Skein Dyeing—Made by Liberty Coppersmithing Company, Philadelphia

vents the formation of the brownish slime which often occurs.

Finishing Equipment

In many types of calenders, Monel metal steam boxes are used, and some textile machinery companies have made this construction part of their standard equipment. Monel metal is also used for calender rolls. Others employ Monel in the construction of their steaming machinery and presses. These are rather recent developments, and we regret that very little information is at our disposal.

The largest use of Monel in finishing equipment is undoubtedly for the cylinders of drying machines. Refinements in the welding, brazing and silver soldering of the metal have made their construction possible. The tinned copper cylinders require retinning, which is in itself expensive and requires shutting down the machine. Monel metal cylinders are always in commission and probably improve the finish of the goods.

For a number of years manufacturers of tenter clips have been using Monel metal for both the plate and the gate. The best construction, apparently, is a cold rolled Monel metal face plate and a bronze gate. These clips give the maximum service where caustics, acids, etc., are used, and stand up under the abrasion of heavy back-filled goods.

The Construction of Tanks

While the dyehouse profits a great deal by the use of Monel metal in machines, its valuable combination

Skein Dyeing Machine with Monel Metal Tub and Fittings—Made by Giles Dyeing Machine Company, Philadelphia

Tentering Clip with Monel Metal Face Plate and Bronze Gate—Made by Textile-Finishing Machinery Company, Providence, R. I.

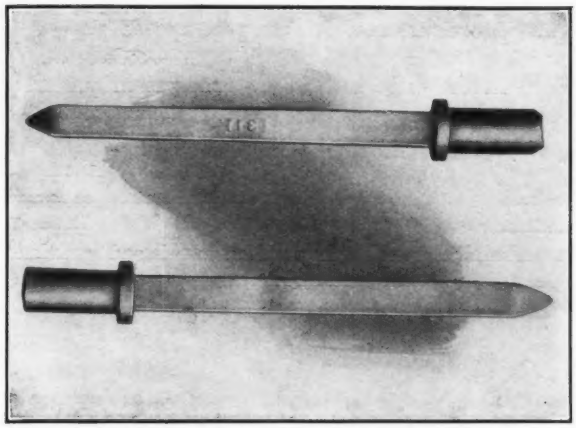
of properties makes it good for the construction of tanks, dye barks, etc.

Probably the largest use of Monel metal for textile equipment is for tanks and parts such as linings, false bottoms, partitions, outlets, tie rods, bolts, nuts, washers and clamps.

The tanks are primarily of two kinds—self-supporting all-metal tanks and wood tanks lined with Monel metal. The former are either welded or riveted and calked. Some manufacturers are doing excellent work by spot welding. This construction has recently been described in Textile World, December 1, 1923 (anonymous). The linings of wood tanks are usually lock-seamed, the inside of the joint in contact with the liquid being filled with silver solder, such solders containing from 40 to 80 per cent of fine silver. The outside of the joint has soft solder sweated into the seam. Washouts or drains may be of all-Monel-metal construction, but the Monel metal outlets having a rubber plug are probably the best available.

The Use of Monel Metal in Rolls and Reels

Mention has already been made of the use of Monel metal rolls in jiggers, padders and compartment dyeing machines for handling piece goods, but little has been said of their construction. Very suitable rolls for jiggers are being made from drawn welded Monel metal tubing. The proper length of tube is fitted with a Monel shaft and cast Monel metal heads, machined



Monel Metal Gudgeons for Wood Rolls—Manufactured by Thoman Bronze & Brass Company

to fit, are welded into place. This makes a very substantial roll, well balanced and true to size. The larger sizes of roll—namely, those above 4 inches in external diameter—have, until recently, presented a more difficult problem, no ready-made tubing of suitable size being available.

There are certain operations which require a heavier type of roll, and these are being successfully made by centrifugal casting. Such rolls are largely used in bleaching processes. One manufacturer advises that they have had Monel metal rolls in daily operation for over ten years submerged in solutions of caustic soda, hydrogen peroxide, sodium carbonate, dilute mineral acids, organic acids and soap.

Rolls covered with light gauge Monel metal are employed in piece goods carbonizing machines, where they have been found to stand up well in contact with sulphuric acid or aluminum chloride, depending on the process used. As these rolls are light, for carrying purposes only, a lock-seam construction, silver-soldered, is satisfactory.

Monel metal is also used in the construction of bar reels for piece goods dyeing machines. These reels are of many different types, the exposed metal parts being Monel. The spider type of reel with flanged heads is frequently made entirely of Monel metal, particularly when the machine is to be used for bleaching. Folding reels also employ Monel in their construction, both for the fittings of the all-wood reels and for the all-metal reels.

In the oval reel type of dye beck the old worn wood reels are frequently covered with sheet Monel metal.

Similar in construction to reels are the paddles of the paddle type of hosiery dyeing machine.

Modern Dyehouse Utensils, Etc.

Many and varied are the developments in the use of Monel metal for utensils in the textile plant. Batch transfer cans of many shapes and sizes are now available constructed of Monel metal. The same thing may be said of the various types of dippers, scoops, pails, funnels, strainers, etc., except that longer life rather than danger of staining goods was the object of making these in Monel.

In the plant where Monel metal is used, sample dyeing is, of course, done in small sample dyeing machines or in hand vats of various types lined with Monel. Seamless hand vats of various sizes for this purpose are also made in Monel metal. Also steam-jacketed kettles for color mixing.

In every plant the problem of conveying corrosive liquids is of prime importance. The use of Monel metal tubing, valves and fittings is helping to make this problem easier. Although no iron pipe size Monel metal tubing is available, the drawn welded Monel metal tubing serves the purpose admirably if threaded with the S. A. E. standard thread. This is necessary

Monel Fans at Rosemont Dyeing Plant, Guerin Mills, Woonsocket, R. I.

(Courtesy Davidson Fan Co., Newton, Mass.)

because of the thin wall of the tubing available, which ranges from ⅜ inch, outside diameter, to 4 inches, outside diameter; in wall thickness from 0.035 inch up to 0.083 inch.

All-Monel-metal pumps for use in the dye and bleach house are now available. Hard rubber pumps with Monel shafts and fittings are very suitable for handling tetrachloride of tin.

Ventilation fans corrode rapidly; it is therefore often economical to make them of Monel metal. The illustration shows two of a number of Monel metal fans in the Rosemont dyeing plant of the Guerin mills. Some of these fans have been installed for over twelve years where the previous fans lasted but a couple of years. In this particular case the corrosion is so severe that it necessitates installing the belting and pulleys outside the building.

We welcome any questions which are raised by this description of uses. As stated in the introduction, we expect to enter into a more complete research study of these problems, and such questions as cannot be answered to-day we will be glad to include in our research program.

Should any questions later occur we would be glad to receive letters from any members of this Association on their problems in connection with the fabrication or use of Monel metal.

President Olney—We have all been interested in this talk and also in the slides which have illustrated so well the use of Monel metal. I am sure Mr. McKay will be glad to answer any questions you may ask.

A. C. Persons—I would like to ask Mr. McKay, where a break occurs in the dye-box lining, how it may be repaired?

R. J. McKay—That is rather a broad question. It depends upon the break. Usually it can best be repaired by welding.

Mr. Persons—A break in the soldered seam?

Mr. McKay—If it were a silver-soldered seam it would practically have to be resilvered and soft-soldered.

Mr. Persons—That requires an outside man to do it then?

Mr. McKay—Yes, unless you have a man who has had experience in silver-soldering. We have a man who spends perhaps 50 per cent of his time on the road helping people who are having trouble with Monel metal machines. If they have real problems, we are glad to send him to help them.

G. K. Hannah—I would like to ask Mr. McKay if there is any special reason for using the rubber plugs in the outlets instead of Monel metal? I notice he mentioned that they used the rubber plugs.

R. J. McKay—Yes. It is partially a question of making the plug fit, and the fact, which I will have to admit, that Monel castings at times are not as clean on the surface as they should be. If our outlet is a casting it will sometimes be hard to get a plug to fit and stay fit. Therefore, the rubber plug is more advantageous. However, cast plugs are being used successfully.

Dr. Ludwig Bäch—I should like to ask the speaker whether Monel metal withstands the action of sulphide of soda?

Mr. McKay—That is another very broad question. I would say "No, not under all conditions." Under certain conditions, however, it will. Under some, it will not.

A. R. Thompson, Jr.—I would like to offer a suggestion.

In stripping hosiery with hydrosulphite, it was found that the Monel metal machine blackened very seriously due to formation of metallic sulphides, of course. This was avoided, however, by adding enough soda ash to keep it alkaline, and the metal was not blackened.

President Olney—I don't wish to curtail the discussion, but we have very little time left and we still have some papers left. I will now call on Dr. Hollander who will present a paper on "Factors Which Affect the Stability of Hydrosulphite Discharge Pastes, with Suggestions for Improvement." Dr. Hollander! (Applause.)

FACTORS WHICH AFFECT THE STABILITY OF HYDROSULPHITE DISCHARGE PASTES, WITH SUGGESTIONS FOR IMPROVEMENT

By Charles S. Hollander

Research Laboratory, Rohm & Haas Company

The factors which affect the stability of hydrosulphites and sulphoxylates in general are the following:

In the first place, they are all sensitive to heat. A solution of sodium hydrosulphite concentrated will decompose very quickly when heated, and this decomposition is the faster the less alkali is present. This decomposition is represented roughly by the formula $2Na_2S_2O_4 = Na_2S_2O_3 + Na_2S_2O_5$. As the decomposition goes on, more of the acid meta-bisulphite or bisulphite is formed, which must be neutralized by a corresponding amount of free alkali either in the form of carbonate, caustic or other form, so as not to cause an increase in the rate of decomposition due to the acid reaction. An acid reaction will cause the formation of free hydrosulphurous acid, which breaks up within a few minutes and is only perceived by the characteristic yellow-brown color of its solution; it cannot be isolated. The sodium thiosulphate generated in this reaction is not stable in the presence of acid, and any traces of heavy metals present, which would gradually be precipitated as sulphides, become visible, since most sulphides are colored compounds.

The range above which sodium hydrosulphite is so

unstable as to be practically valueless is 120 to 140 deg. Fahr., according to the alkalinity present.

Sulphoxylates are much more stable to temperature than the corresponding hydrosulphites, due to the stabilizing effect of the formaldehyde, which forms compounds of a complex organic nature and not merely molecular addition compounds. Sulphoxylates, especially those of sodium and zinc, may be heated to boiling temperature of water without rapid decomposition in neutral or alkaline solutions. Above the temperature of boiling water, however, they break down practically as rapidly as the hydrosulphites, and all the remarks made for the hydrosulphites above apply to the sulphoxylates, only on a higher temperature level.

The free sulphoxylic acid, which has never been isolated, may exist for a short time and is a very powerful stripping agent; but, like the free hydrosulphurous acid, its life is limited to half an hour or less, according to the hydrogen ion concentration of the solution.

In the second place, all hydrosulphites and sulphoxylates are sensitive to oxidation. Sodium hydrosulphite is such a good absorbent for oxygen that its solution has to be protected from the air very carefully; it has been recommended for the quantitative determination of oxygen in gas analysis work. The sulphoxylates are less easily oxidized by the oxygen of the air, but in the presence of substances that will give off oxygen, or its equivalent, they are very easily oxidized.

Third—All hydrosulphites and sulphoxylates are very sensitive to acids, as already set forth under No. 1.

Fourth—All hydrosulphites and sulphoxylates are sensitive to moisture, which acts as a catalyst for decomposition, both through oxidation and auto-oxidation.

If all of these properties are constantly borne in mind in applying these compounds, it should be possible to avoid an undue deterioration and consequent loss of money value.

As regards the application of sulphoxylates in discharge pastes, I therefore would recommend the following:

1. Avoid heating above the optimum temperature, especially in the presence of acids or acid printing pastes.

2. Use freshly prepared pastes. The longer these pastes stand before using the weaker they get in reducing power and the more acid the paste grows by fermentative processes. If it is necessary and advisable to use acid printing pastes I would strongly recommend that about 2 per cent of formaldehyde, based on the weight of the paste, be added. This formaldehyde acts as a stabilizer of the sulphoxylic acid. It seems to cut down the hydrogen ion concentration.

3. The hydrosulphites and sulphoxylates themselves should always be stored in a cool dry place and in the absence of acid fumes. They should be kept tightly covered at all times, and the operators should be instructed not to use wet utensils in taking their requirements out of the original packages.

4. Since a good many materials enter into discharge pastes, it is highly advisable to avoid those containing traces of heavy metals, whose sulphides are colored, because the formation of some hydrogen sulphide is unavoidable, especially at higher temperature, which quickly reacts with any heavy metals present, coloring the paste and possibly giving rise to discolorations of the discharged area. It is also advisable to check up on the Ph of the thickening agents used.

5. Since sodium sulphoxylate-formaldehyde is very easily soluble in water, a solution of about 60 per cent strength may be easily prepared that will not crystallize out even at room temperature. It is therefore much to be preferred to add this solution to the thickener, instead of forcing a solution of the sulphoxylate in the viscous paste, resulting very often in serious overheating and consequent loss of strength.

I would like to add to this that in our opinion it is very important to watch the acidity of the paste, or as I mentioned before, the Ph value of the paste.

In former days we used to express acidity and alkalinity. That doesn't tell the whole story, however, as you can readily see, by thinking that a tenth normal acetic acid solution and a tenth normal hydrochloric acid solution will show up exactly alike by titration. But their intensity is vastly different as shown with a suitable indicator.

A determination of the Ph value does not necessarily mean that you have to make a cumbersome determination with the potentiometer; it simply means that you must use a suitable range of indicators and those indicators right now are available in almost any range you want and are just as easily employed as a solution of litmus or phenolphthalein. (Applause.)

President Olney—Are there any questions in regard to this paper?

O. H. Forsdale—I should like to ask Dr. Hollander if it is possible by using caustic to increase the temperature in discharging?

Dr. C. S. Hollander—Yes, the more alkali you have the longer the hydrosulphite will persist. But you must, of course, consider whether more caustic or more alkali will not change the color of your goods, the shade, and the brightness.

Mr. Forsdale—How about discharging direct colors? Is it all right to discharge them on the jigs, or is there a better method of discharging them?

Dr. Hollander—I am afraid I can't answer that.

A. R. Thompson, Jr.—I would like to offer a suggestion on that line. It doesn't make any very great difference. If you are discharging direct cotton colors, almost as soon as the hydrosulphite solution hits the direct cotton colors at the raised temperatures, a reduction takes place. In only a few instances does that color return on oxidation. There are, however, a few direct cotton colors that cannot be stripped.

Mr. Forsdale—I understand, but what I was interested in particularly was this: what is the most suitable method of discharging in bulk? Suppose you have a bulk batch of cotton goods and you don't want to take the long tedious method of putting them on the jig—is there any other way of discharging them in bulk?

Mr. Thompson—You could do it in the kier if you wanted to.

Dr. C. S. Hollander—The chief consideration you must have in mind always is to conserve the strength of the hydrosulphite or sulphoxylate and avoid waste by the oxidation of the air. Consequently, such dyeing machines are not so good for stripping as the old-fashioned tub, in which the whole batch could be stripped at once.

Mr. S. F. Carter—In regard to stripping and conserving the strength, the jig is not so advisable to use in some ways (as a kettle) because you do not get the time of immersion in the liquor, and there is also much more exposure to the air.

There is another fact which comes up in connection with stripping. Suppose you use sulphoxylated formaldehyde, adding its molecular equivalent of bisulphite of soda, or a little in excess of this quantity; when you get up to a temperature of 140 to 145 deg. Fahr. a rather interesting reaction begins to take place. At that temperature the formaldehyde molecule begins to leave the sulphoxylate and combine with the bisulphite, so that all the time there is a continual liberation of hydrosulphite which acts in the nascent state, its most powerful condition. As the temperature rises this liberation or transference of the formaldehyde molecule becomes more rapid, and the stripping action more intense.

If you are using the ordinary hydrosulphite, when you get your temperature up, some of it is stripping, and some, of course, is simply decomposing in the bath. In the case of the sulphoxylate and bisulphite, hydrosulphite is being liberated as required and doing its work right along.

Dr. Chas. S. Hollander—Just in a theoretical discussion, I would rather hesitate to accept that theory that you are getting hydrosulphurous acid in the nascent state—

Mr Carter—Hydrosulphite of soda—

Dr. Hollander—You said with the sulphoxylate and the bisulphite— I don't think you can really call that a liberation of the hydrosulphurous acid there, because you don't see that characteristic yellow color.

O. H. Forsdale—My experience with the sulphoxylate formaldehyde was in using it at the boil with acetic acid, and I have used it at the boil with acetic acid. At that temperature, the formaldehyde odor was very disagreeable. This is really a new one on me, that is, using bisulphite at a temperature of 140. I would like to ask Mr. Carter if at that temperature there was any noticeable odor of formaldehyde.

Mr. Carter—No, there is not, because the formaldehyde is passing over and combining with the bisulphite. While the stripping action begins at 140 to 145 deg. Fahr., the temperature is raised to just under the boil as usual in stripping.

President Olney—We still have another paper. We shall have to adjourn very soon, but I think Mr. Sokolinski's paper is rather short, and we would like to have him present that before we adjourn.

ANALYSIS OF SIZING MATERIALS

By J. J. Sokolinski

Arabol Manufacturing Company, New York

Probably all of you know the extent to which starches, dextrines and sizing compounds are used in the various proc sses through which textile materials are manipulated before they are placed on the market.

There is no question but what starch is one of the most important products used for sizing and finishing. However, we must take into consideration the grade of starch to use for the particular finish desired.

Cold water, alcohol or ether will not dissolve starch, but when starch granules are heated with water to about 155 deg. Fahr. they swell and split open, forming a thick mass. By boiling with a large volume of water the particles become so finely divided that they may be passed through a filter, and if boiled for a long period of time the starch is rendered soluble.

Corn or maize starch may be used where a hard, firm finish is desired. This starch may be cooked for a somewhat longer period of time than potato without its boiling thin again.

Potato starch may be used for most classes of material where smoothness and pliability are desired, and is oftentimes used for sizing worsted warps where, for the finer counts, this type of starch is particularly suited.

However, in the preparation of a size with potato starch care must be taken that the size is not boiled for too long a period of time, otherwise it will become thin and watery, due undoubtedly to its partial conversion into starch sugars of the glucose type.

Too much care cannot be taken in the preparation of the size. The best suited boiler is, in my opinion, a

steam-jacketed kettle which will insure a more uniformly prepared size than would be obtained if live steam were used.

The ingredients should all be carefully weighed, and not measured as so many scoops of starch, so many quarts of finishing compounds, etc. It is essential at all times that a thermometer be used for the control of temperature of the kettles.

Certain thin boiling starches, particularly potato, will reach their maximum efficiency at 190 deg. Fahr., and if the temperature is raised beyond that point they liquify and do not possess nearly as good value.

It is my opinion that a thin boiling starch is the best for use in sizing warps, to give strength and smoothness, and hence better weaving. It is usually taken for granted that in the sizing of warps the best results are obtained where the fibers are surrounded by a thin coating or film. This film, protecting the thread and encasing the small fibers, gives added strength and lessens the friction of the thread in weaving. It would be interesting to hear the views of our members on this subject.

Personally, I believe that a size that has thoroughly permeated the thread is the ideal product to use. However, it is not always necessary to use a soluble starch, as excellent results can be obtained by the addition of scientifically prepared compounds whose chemical nature is such as to assist the starch (such as Maine potato starch) in penetrating, and at the same time giving flexibility and smoothness to the thread. Typical of such compounds are the Amid-Duron products.

A yarn encased in a film of starch, in my opinion, unless exceedingly flexible, is not as strong as a yarn in which the size has entered into every section of the thread.

The proportion of softeners to other ingredients in the size is of the utmost importance. Classed under this title I might mention soluble oils, soluble tallows or specially prepared compounds. The proper amount of any of these compounds to use is of prime importance. Too little softener will allow the starch to dry in a harsh condition, while the use of too much softener will destroy the adhesiveness of the starch and cause the dusting of the size in the loom.

Soluble oils or compounds adulterated with mineral oils should not be used. The mineral oil will have a tendency to encase the size and prevent its proper functioning. Material sized with compounds containing mineral oils may have the appearance of being perfectly prepared, but trouble is likely to arise upon the removal of the sizing material, when the goods may be found to be in a spotted condition, which may or may not be remedied in the subsequent kier boiling. In the case of animal or vegetable fats used in combination with sizing materials, these would be easily removed in the subsequent processes and hence possess decided advantages over mineral oil combinations.

Weighters and weighting compounds are largely employed, and possess the advantage of delivering the desired compounds in a convenient form for handling.

President Olney—If there are any special questions you would like to ask about this paper, we can devote about two minutes to it.

E. H. Hinckley—The question of the swelling of the stock is one that I have taken up in considerable detail. I notice you speak of the stock being broken up. I wonder if that is the result of test or of general opinion. I know in looking through a microscope we find the granules split, but they do not break up unless you do it mechanically.

Mr. Sokolinski—If you had corn, for instance, and you boiled it you wouldn't be able to tell corn from another starch under the microscope unless it began to split up.

Mr. Hinckley—That has not been my experience. Have you had that experience?

Mr. Sokolinski—Yes.

E. H. Hinckley—I have a number of views in which you can identify any starch after it is boiled, providing it hasn't been browned after or before it was boiled. I am sorry I haven't them here with me.

There is another point I wanted to ask about and that is in connection with mineral oil. You spoke of mineral oil adversely. That is contrary to my experience—

J. J. Sokolinski—It has been my experience that mineral oil compounds after sizing will not take the dye.

Mr. Hinckley—Of course, there are several kinds of mineral oil compounds. The mineral oil compounds that are emulsifiable are probably familiar to you, the wool oil—

Mr. Sokolinski—Some mineral oils will come out by emulsion, but it all depends on what process is used in the kier when you are boiling it.

Mr. Hinckley—All the mineral oils I speak of do come out without a great deal of trouble; they are properly prepared for that purpose. They are used in batching the wool stock. There are other mineral oils that you are probably familiar with that are made up, for instance, on the basis of rosin soap for so-called soluble oils that emulsify in cold water. Those sometimes come out very readily.

Mr. Sokolinski—It has been my experience that we have had trouble afterwards only with a kier boiling caustic, where no soap was used. Of course, if the soap is used and you can emulsify the oils, then they are all right.

E. H. Hinckley—Mineral oils are so processed to-day as to make them readily emulsifiable, and therefore they do not interfere with the process of dyeing and bleaching.

J. J. Sokolinski—There are so many now that there are all kinds of mixtures.

Mr. Hinckley—Of course, there is a good deal of sophistication with sulphonated oil; mineral oil is put into it. But I am not interested in that. I am interested in bringing out the fact that mineral oil can be emulsified properly. In order to emulsify properly you must reduce the size of your drop to a certain definite measurement. Above that, it won't stay emulsified. Below that, it will. With that size drop, it emits about 76 per cent oil.

President Olney—We still have several papers and discussions. I am afraid, however, that we shall either have to print those in the proceedings without having them delivered here or we shall have to save them for the first thing on the program a year from now, or perhaps some of the local sections may be able to utilize them. All we can do here now is to read them by title:

"A New Process for Resisting Wool," and

"Trouble Caused by Bacteria and Molds Upon Textile Materials."

There was no speaker assigned to the first subject except Mr. Durfee who had volunteered to say a few words on the subject, and for the second subject, A. K. Johnson had been appointed to open the discussion.

I think we shall consider the meeting adjourned, without any further formality, until the banquet this evening.

. . . The meeting adjourned at 5.15.

ADDENDA ON VAT COLORS

[*Editor's Note—The following remarks were made by Dr. J. P. Jaeck at the symposium on vat colors held by the New York Section on October 26th, but, for unavoidable reasons, were omitted in the published account of that meeting.*]

Following Mr. Carter's just remarks on vat dyes, we must bear in mind that when applied on cotton the best results are obtained when colors belonging to the same group are used in the blending of shades. For this reason vat dyes belonging to the Indanthrene class are in very rare exception combined with colors of the Indigo group, and vice versa.

From mill experience, whether vat colors are used on loose cotton yarn or piece goods, it occurs at times that colors of the same group are reduced and dyed at varying temperatures. This, of course, compels the dyers to exercise a great deal of care in the selection, application, and handling of such dyes.

The type of dyeing machine used is a big factor in the selection of vat dyes. Since the adoption of vat colors on cotton, considerable progress has been made in dyeing machines of the circulating type, and we must say that a great deal of good work has been performed in this direction by the technical forces of the mills and dyestuff manufacturers as well.

Although warp dyeing by the Scotch tub method or continuous system will remain in practice for a long time, it is certain that vat colors are extensively used, and this with a great deal of success, in dyeing machines known as package or beam dyeing machines.

For the warp dyeing process one must select colors which will remain a long time in a state of reduction and exhaust at the same rate. For the method of circulation such as is used in the Franklin, Delahunty, Morton, etc., machines, the dyer has to select vat colors of perfect solubility. It occurs that when certain vat colors are used in shade combination in circulating machines for raw stock or yarn, some exhaust more than others; the addition of glue or any other retarding agent to the dye bath will correct this defect.

Vat colors are used to-day very extensively on cotton fabrics of all sorts. Although their actual cost seems to be out of proportion to other cotton colors, the mill men and the consumers are well repaid for the advantages derived from the use of vat colors.

From the very beginning of their discovery, vat colors have been dyed on wool and silk, but up to the present time very little effort has been made to increase their use on animal fiber. This may be due to the fact that fast colors on wool and silk are easily obtained at a reasonably low cost.

Vat dyes of the Indanthrene group or Anthracene derivatives have very little affinity for wool or natural silk, whereas vat dyes of the Indigo group have great affinity for such fibers and display at the same time a high degree of fastness. It is not strange to see certain vat colors very fugitive to light or washing when dyed on cotton, but when the same vat colors are applied on silk or wool they show qualities of fastness which at times surpass the best alizarine colors. We have in this class the Helindones, Thio-Indigoes, and a few Ciba colors. It will not be surprising to see in time some alizarine colors displaced by the vat colors; it has been done on cotton in printing and will surely occur in dyeing loose wool.

Notwithstanding the fact that the manufacture of vat colors is very complex and difficult, we are certain that the textile trade, if not the public, is very appreciative of the efforts made, and this in a very short time, by the dyestuff manufacturers. It may not be very long before new vat dyes will be added to the list of those already manufactured in this country.

NEWLY ELECTED MEMBERS

At the meeting of the Council held at Boston, Friday, January 18th, the following applicants were admitted to membership:

Active Members

Alvater, Raymond, Grant Avenue, Beechwood Heights, Bound Brook, N. Y.

Bayer, Richard, 202 Wentworth Avenue, Edgewood, Cranston, R. I.

Bohl, Jr., Edward, 34 East Fifth Street, Paterson, N. J.

Brown, G. Arthur, Harris Avenue, Rd. No. 34, Route 1, Bound Brook, N. J.

Burnett, Raymond L., 709 Hospital Trust Building, Providence, R. I.

Clay, Tom, P. O. Box 51, Crompton, R. I.

Demers, William J., 1294 Main Street, Worcester, Mass.

Elmore, Frank H., P. O. Box 666, Providence, R. I.

Gardner, J. Elbridge, 240 William Street, Orange, N. J.

Graham, George E., 180 West Eighty-second Street, New York City.

Hanke, Ernst E., Lincoln Bleachery & Dye Works, Lonsdale, R. I.

Keeler, Edwin A., 35 Martin Road, Verona, N. J.

Kelley, Robert W., 128 Morton Avenue, Woonsocket, R. I.

Krebs, Charles G., 78 Gilbert Street, Woonsocket, R. I.

Lilley, S. Clark, 270 Benefit Street, Providence, R. I.

Magner, John J., 238 Cumberland Street, Brooklyn, N. Y.

Mitchell, Richard M., 76 East Main Street, Webster, Mass.

Newell, Richard F., care of Ciba Company, Washington and Cedar Streets, New York City.

Northup, George A., 27 Third Street, Haverstraw, N. Y.

Peacock, William H., 372 Fifth Street, Brooklyn, N. Y.

Powell, John G., Weiss, Willheim Company, Passaic, N. J.

Zillessen, Walter H., Newport Chemical Works, Passaic, N. J.

Junior Members

Brosnan, William F., 38 Second Avenue, Lowell, Mass.

Buchan, Norman S., Lincoln Street, Andover, Mass.

Cote, Theodore, 61 Main Street, Groveland, Mass.

Donaldson, Edwin R., 19 Madison Street, Taunton, Mass.

Goosetrey, Arthur, 58 West School Street, Woonsocket, R. I.

Herrmann, Jr., Albert E., 90 Mt. Vernon Street, Lowell, Mass.

Meeker, Samuel, 248 Foster Street, Lowell, Mass.

APPLICANTS FOR MEMBERSHIP

Active Membership

Boehringer, R., Ph.D., chemist, United Piece Dye Works, Lodi, N. J. Sponsors: H. R. Davies and J. J. Sokolinski.

Griffin, Martin L., chemist, Mount Hope Finishing Company, North Dighton, Mass. Sponsors: L. A. Olney and A. K. Johnson.

Hales, W. W., demonstrator-salesman, Sandoz Chemical Works, Inc., New York City. Sponsors: F. M. Bonnett and H. J. Stulz.

Riley, Benj., Jr., chemist and demonstrator, John D. Lewis, Providence, R. I. Sponsors: George A. Hayes and William Witte.

Junior Membership

Endriss, Paul A., assistant dyer, Peerless Silk Dyeing Company, Philadelphia, Pa. Sponsors: Percival Theel and E. C. Bertolet.

Mazer, Samuel, student, Lowell Textile School. Sponsors: L. A. Olney and A. K. Johnson.

Mitchell, A. S., student, Philadelphia Textile School. Sponsors: P. Theel and E. C. Bertolet.

Sturtevant, Fred W., student, Lowell Textile School. Sponsors: L. A. Olney and A. K. Johnson.

CHANGES IN ADDRESSES OF MEMBERS

The following changes in addresses of members should be noted:

Betz, L. Drew, care of E. F. Drew & Co., 136 State Street, Boston, Mass.

Bloxham, Harold C., 65 Englewood Avenue, Pawtucket, R. I.

Bromley, Frank, 230 Fifth Avenue, New York City.

Brown, Geo. W., American Woolen Company, Oil and Paint Plant, Medford Hillside, Mass.

Browne, N. B., care of Kuttroff, Pickhardt Company, 157 Federal Street, Boston, Mass.

Cady, William H., 79 Brown Street, Methuen, Mass.

Chase, R. L., 320 Broadway, New York City.

Chase, Robert W., 379 Washington Street, Canton, Mass.

Deane, R. J., 26 Milton Street, Fall River, Mass.

Fischer, R. M., P. O. Box 414, Farmingdale, L. I.

Fitzgerald, John F., 30 Canal Street, Winchester, Mass.

Giles, H. E., 63 Greenhood Street, Dedham, Conn.

Johnson, George H., 1647 Holland Avenue, Utica, N. Y.

Masserene, Jas. S., 17 Campbell Street, New Bedford, Mass.

Normand, Jr., W. T., 200 Hersom Street, New Bedford, Mass.
Sawyer, Joseph W., 151 Prospect Street, Franklin, N. H.
Selya, Hyman P., 10 Littell Road, Brookline, Mass.
Stott, Jr., J. G., 539 Manhattan Avenue, New York City, N. Y.
Wang, Chen, 1333 Volland Street, Ann Arbor, Mich.
Fred H. Webster, 117 Larch Street, Providence, R. I.

NOVEMBER MEETING OF RHODE ISLAND SECTION

The November meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held jointly with the Rhode Island Section of the American Chemical Society in the rooms of the Providence Engineering Society, 44 Washington Street, Providence, R. I., on Friday evening, November 23, 1923. Ralph F. Culver, Chairman of the Rhode Island Section of the A. A. T. C. C., presided.

The Chairman spoke briefly concerning the forthcoming annual meeting and banquet to be held on December 8 and called upon B. B. Fernald, of the committee of arrangements, to address the gathering. Mr. Fernald outlined the plans which had been made for the meeting, and expressed a desire that every man of the Association be present at all of the functions in connection with the annual meeting.

The Chairman then introduced L. A. Jones, of the Eastman Kodak Company, who read a paper entitled "A Colorimeter Operating on the Subtractive Principle."

Mr. Jones will soon have in our hands a copy of this paper for publication.

A very interesting series of discussions followed Mr. Jones' paper. The attendance was about 115.

RALPH F. CULVER, Chairman.

ASSOCIATION BADGES

Those who attended the Annual Meeting at Providence had an opportunity to examine and purchase the new lapel button badges which were there distributed by the Secretary.

For the benefit of members who were unable to attend the meeting an illustration of the badge is shown herewith:

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

WALTER E. HADLEY,
5 Mountain Avenue,
Maplewood, N. J.

AMERICAN
DYESTUFF REPORTER
SAMPLE SWATCH QUARTERLY

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

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January 28, 1924.

CREATIVE PROGRESS

IT has been repeatedly said by men prominent in the dyestuff and textile fields that the American dyestuff industry cannot be termed truly successful and entirely independent until it shall have become established upon a creative basis rather than an imitative one. In the advertising section of this issue there are shown swatches wherein at least two entirely original American colors are displayed, as well as several others which have very recently been produced in America for the first time.

Considering the record made during recent months by American dyestuff producers, there can be little doubt in the mind of any disinterested judge that the time is not far distant when we can be said to have truly "arrived." This does not mean that our manufacturers should lessen their efforts along creative lines—rather, that they should increase them. It does mean, however, that very tangible results are being accomplished, and that if the same pace is maintained they have little to fear from foreign competition.

COMMERCIAL OPTIMISM

DURING a recent trip through New England we were impressed by the varying mental attitudes developed in the dyestuff fraternity by the seasonal dullness existing in New England textile circles. Nowhere did we find anyone claiming that business was exceptionally good, and in some quarters it was reported as exceedingly slow. Nevertheless, there was a general lack of anything approaching the pessimism which existed a couple of years ago during a period of somewhat similar conditions.

Apparently, dyestuff manufacturers and dealers have come to realize that fundamental conditions in this country are extremely sound. One who keeps abreast of commercial reports as published in the daily press cannot fail to reach this conclusion. Current retail business in all parts of the country, as reported by mail-order houses, chain stores and large metropolitan department stores, is universally better than during the last couple of years; freight-car loadings are each week establishing new records for the season; money is easier than it has been for a long period; inventories of manufactured goods are remarkably low.

In fact, there is nothing on the horizon, save the old bugaboo of "Presidential year," which could serve as an excuse for pessimism regarding the immediate commercial outlook. Hence we feel safe in venturing the prediction that if dyestuff manufacturers and dealers will constrain themselves patiently for a short time they will be rewarded by a most satisfactory volume of business.

THE TARIFF

ON October 1 of this year the ad valorem duty on imported dyestuffs automatically drops from 60 per cent to 45 per cent. This fact is beginning to cause concern to American dyestuff manufacturers, and one hears occasional remarks to the effect that an effort will be made to amend the present tariff law before this reduction goes into effect.

It is our belief that no such amendment will be seriously attempted, and that even if introduced into Congress it is almost certain to be sidetracked because of the commotion occasioned by various campaign issues. In other words, we believe that the reduction will go into effect as scheduled.

We do not believe, however, that the effect upon the American industry will be nearly as serious as some persons imagine. It is quite true that a reduction of 15 per cent will make it possible for importers to compete successfully on some products which it is now impossible to import at a profit. On the other hand, we believe that the very rapid progress being made by American manufacturers in the way of developing new products and, through increased efficiency, in decreasing the costs of products now manufactured will be sufficient to maintain for American manufacturers a percentage of the total business equal to that which they are currently enjoying.

When all is said and done, the importer is a great tonic to the industry. Without the threat of foreign competition it is extremely improbable that such marked progress as has been made would have been effected. As "David Harum" remarked, "A certain amount of fleas is good for a dog." In other words, if an individual or an industry becomes entirely satisfied with its present condition it ceases at once to progress and must soon retrograde. The ever-present threat of competition from abroad serves to keep American manufacturers keyed up to the highest point of endeavor and undoubtedly benefits the consuming industries tremendously. In our opinion, the competition which our domestic manufacturers have most to fear is not that which emanates from abroad on the high-priced colors but the ruinous and ridiculous tactics which are so frequently adopted in intranational competition on the low-priced colors of quantity consumption which, after all, must always form the bulk of our domestic production.

T. C.'S COLUMN

A HACKNEYED SUBJECT—RESEARCH

HAVE you ever thought of the strange state of the textile industry, which has grown to be one of our very largest without any great amount of scientific assistance aside from the manufacture of the dyes and chemicals used in it? We cannot help but wonder at such a marvelously intricate structure reared on a foundation so completely empirical. At the same time, we all have a feeling that there is a need for the application of a great deal more science to the industry as it stands. Are we not justified, too, in a hope that scientific research may ultimately produce truly revolutionary changes in textile manipulation as it has already done in so many other fields?

We are prone, also, to rail at the big entrepreneurs who for some reason appear to make plenty of money but in whom we have so far failed to inspire an interest in research. We know they ought to be more interested in it; we feel sure that, while it would mean the spending of a lot of money, it would ultimately pay extra good returns, but somehow, except in relatively few cases, it hasn't "taken."

It is strictly up to us. We have not been able to sell these men something they think they do not need. The remedy is to keep at it, do less growling and more work, follow up each point of contact and each point of yielding, and our ideas will gradually get across in proportion to their merit.

Since there is no immediate prospect of founding or properly endowing large research institutes, the next best thing is to tackle our own problems as best we may and, so far as possible, in an organized manner.

The A. A. T. C. C. has made a commendable beginning in devising and publishing standard tests for fastness, and we hope the good work will go on and expand indefinitely to larger and larger problems. Good sense has been shown in first taking up matters of humble everyday use.

We think of research problems as being naturally divisible into several groups—for instance, the devising of tests and establishing of standards, or factory problems with research features; but greater than these, and, in a sense, more important, because they treat of the underlying principles, are the more theoretical foundations of textile chemistry.

I have often deplored the lack of real textile research in these fields in the United States, but in a sense that is not correct; for, while we have no such pretentious affairs as some of the English and German research institutes, there are plenty of men here doing interesting and important work. Nor are we as some Europeans who appear to strain at the gnats and swallow whole fleets of the ships of the desert; our research efforts are directed toward fairly definite ends, rather than being great collections of detail about other details. We all know from numerous repeatings that any little problem followed to its conclusions may revolutionize an industry or create a new one. However, I would rather see someone devise a system for expressing the rate at which cotton absorbs individual dyes at different per cents and temperatures, and tabulate the results for twenty-five or fifty common direct colors than to produce half a dozen new ones or to invent some ingenious process for attaching pulverized fish scales to cotton fibers to make an artificial wool.

In other words, while all research is valuable, at least as a matter of record, and may have great potential value, it seems perfectly reasonable and sensible to first devote our effort to the many things on every hand that may help us in our daily work.

This calls to mind a quotation from a textile trade paper which shows *something* about its writer, although I shall have to admit that I hardly know what. He naively remarks that teachers do research for the love of it, and implies that since the personal satisfaction is about all they expect (or get), the thrifty thing to do is to leave it all to them. How fortunate we are to have such people in the community!

At any rate, the presence of these supposedly altruistic individuals has suggested that we could perhaps make much better use of certain research facilities that are already at hand. There are several excellent textile schools with good laboratories, and at thesis time there are always *some* willing workers.

Having these things, the next step is co-ordination. The A. A. T. C. C. Research Committee having functioned so successfully, why not try as the next step a Committee for the Promotion of Research, which may or may not be a separate entity from the other? There are any number of problems that would make good thesis subjects, many of which could be worked out piecemeal. The main requirements would be to split up the larger so that each part could be handled as a unit; to include an opportunity for original thought; to avoid too much simple routine, and, if possible, to lead to a result that would be worth publishing.

This may all sound foolish to the teachers, but it would seem that tangible results would lead to better support and more interest in the schools, as well as adding to textile knowledge.

Research for individual mills does not necessarily require elaborate equipment. Routine tests on the twists of yarns being mercerized, with a record of results obtained, can be made to give a more reliable conclusion on the proper twist to favor high luster than any ordinary set of experiments. It is research and brings results, but the management might not want you to bother with it if you called it that. Proper study of operating statistics and inspection data will often give more and quicker results than a research laboratory. They satisfy part of the desire to do original work, and might pave the way for the real thing.

It is truly astonishing to what extent the textile in-

dustry grew before it felt the guiding hand of science, and even to-day, although we can point out the many contacts between the industry and chemists, we have to admit that the great essentials of the industry were there first. Take cotton bleaching. While chemists have had a hand in furnishing the bleaching agent, its application seems to have been very largely an empirical development. We have followed along, devising ways for its more efficient handling, and have shown the bleacher how to keep out of trouble, but we have made no startling revolution in cotton bleaching (perhaps because it is not possible) and, in fact, we are not yet any too sure whether bleaching is due to hypochlorous acid or more directly to chlorine itself.

So it goes all through this vast empirical structure, the textile industry, science, especially chemistry, is helping to standardize and improve manufacturing methods. However, in trying to extend research here we are handicapped by the record. Discoveries have been due to happy chance rather than to research. T. C.

CORRESPONDENCE

Editor AMERICAN DYESTUFF REPORTER:

Your letter of the fifth received. I have no desire to impose upon you but ask pardon for adding to what I mentioned in my first letter.

I know a dye salesman of very reliable character belonging to an established firm in this country who has told me that many consumers of dyestuffs refuse to buy certain dyes from him, claiming that they are inferior to imported types. Some of these buyers are so prejudiced that they will buy the identical products from a jobber because he declares that they are imported. Of course, the price is increased two or three times and probably the dye is inferior as well, making the actual cost much greater. This salesman I alluded to doesn't care, and the jobber makes a profit. It is the ignorance and unscientific methods of the buyer that makes such conditions possible. If dye consumers bought dyes and chemicals on a laboratory recommendation brokers could not do the business they are now doing. I have seen this proven many times, with a saving to the buyer as high as 50 per cent in the final cost of the dyes.

Too many salesmen take up a buyer's time trying to sell him a substitute for products he is using without knowing enough about the properties of their own product compared to those they are trying to supplant. The salesman who knows his product and who can tell us something definite about its advantages is the man who gets the preference. If I were to test every sample of dye that is in our laboratory and those we receive in one month I couldn't do the many other things necessary in my work. If a good salesman will tell me what a dye will do I can afford to take time to test it. Let the fellow I have found out after a few trials do that and I won't bother with his products in the future. Of course, there are exceptions to any rule.

Compare the statements made by Mr. Bertolet in The REPORTER, Vol. 12, No. 22, page 762, with that of A. Ganswindt in the Color Trade Journal, Vol. 11, No. 3, "Nature of the Fulling Process," and tell me who is right and who is wrong. One or the other is misleading the textile man and ought to stop before more people are misled.

Thanking you for your courtesy, I remain,

Very truly yours,

CHARLES C. DOOLITTLE.

2217 North Court Street, Rockford, Ill.

[NOTE.—The references quoted in the last paragraph of the above have been compared and their accuracy investigated. It was found that either statement regarding the fulling process explained in the articles referred to, is correct. In short, each author gave his personal opinion as to the manner in which fulling is effected, and as the particular phase of the subject which they were explaining is open to conjecture, both authors may be said to have explained the process satisfactorily.]

HERTY ADDRESSES FRANKLIN INSTITUTE

On January 16th, Dr. Charles H. Herty, President of the Synthetic Organic Chemical Manufacturers' Association, addressed the Franklin Institute of Philadelphia on the subject of "The Coal Tar Industries of the United States."

Dr. Herty's talk constituted a complete account of all that has been accomplished in America by the organic chemical industry—a story which is quite familiar to our readers. In dealing with the efforts for protection of the dyestuff industry and with the difficulties of administering the present tariff law, Dr. Herty's speech was of particular interest. A portion of his remarks on these subjects follows:

With the end of this fight (the passage of the present tariff act) it seemed that the American industry was doomed, but a closer study of the measure showed plainly that the outworking of those paragraphs would depend entirely upon the administrative regulations issued by the Customs Divisions of the Treasury Department, upon the work of the Appraiser's office in New York, and upon the decisions handed down by the Board of General Appraisers. Throughout the year 1923, that struggle has been constantly carried on. In the vicissitudes of that bill as it went through its various stages in the Congress, the American valuation adopted for the whole bill by the House was stricken out by the Senate, but in the paragraphs as finally adopted for the coal-tar chemical industry, that new feature in tariff legislation was retained. It was a severe test of that policy, but I think it can be safely stated that this industry offers the most complicated field for tariff enforcement in the whole measure. The necessity of determining whether an imported product was competitive or non-competitive has been

a tremendous task which is only now assuming clarity as a result of the conscientious and painstaking work of the examiners, Messrs. George W. Wolf and Archibald Gillies. Many appeals havve been taken by the importers from these decisions, but the interests of the Government have been ably taken care of by the effective work of the Special Attorney to the Department of Justice, John G. Lerch.

The most difficult task, however, in the administration of these paragraphs has been the work required for the determination of standards and concentration as fixed by the bill, and the testing of the imported products in order to determine whether or not they were competitive. For this work the Government laboratories at the outset were not equipped, and its experts were not experienced, but Dr. George W. Knight, the chemist in charge, undertook this job courageously and with the utmost diligence and impartiality. His efforts and those of the staff working with him have been thoroughly successful, and to-day this complicated piece of machinery is working smoothly and efficiently.

NEW TEMPERATURE CONTROLLER

The C. J. Tagliabue Manufacturing Company announces the addition of an electric contact-type temperature controller to its line of indicating, recording and controlling instruments.

This electric contact controller consists essentially of a dial-indicating thermometer, the pointer of which is actuated by the usual mercury, vapor-tension or gas-filled thermostatic system, depending on the desired range and other specifications. The bulb stem is inserted in the oven, furnace, tank or other apparatus where the temperature is to be controlled, and is connected by a capillary tube to the case, which can be mounted at any convenient location. As the temperature at the bulb increases or decreases, the thermostatic spring uncoils or recoils, thus moving pointer across the scale. The exact temperature existing at the bulb is thus indicated at the case and the responsiveness and closeness of the control may be determined.

The temperature is controlled by the following arrangement: On each side of the indicating pointer is located an arm. These arms are mounted on the axis of the pointer and have mounted on them auxiliary contractor arms. By adjusting the left-hand arm to point to the minimum temperature and the right-hand arm to point to the maximum temperature, control is established between these two points in the following manner: When the indicating pointer reaches the minimum temperature, its contact block makes an electric contact with the left-hand arm, closing a circuit through binding posts L and C, which operate through a relay to close the circuit of an electric heating coil. The current continues to pass through this heating coil until the indicating pointer reaches the maximum temperature and makes an electric contact, with the right-hand arm closing a circuit through binding posts C and H.

The controller may also be used for starting and stopping a motor by means of a motor starter, as in the case of an automatic refrigerating unit.

The least difference between minimum and maximum control temperatures is approximately 1/32 inch. It cannot be expressed in degrees of temperature unless the range of the scale is known.

An adjusting screw is provided for simultaneously lowering or raising the minimum and maximum tem-

peratures at which the indicating pointer closes the circuit. This is accomplished by moving the arms together as a unit to the right or left.

The difference between the minimum and maximum temperatures may be changed by turning the adjustment screw provided within the case. This is accomplished by having the left contact arm move toward or away from the right contact arm. The greatest difference between minimum and maximum control temperatures is approximately one-half of the total range.

Head temperature correction is provided. By means of a bimetallic strip interposed as a link between the spiral spring and the spindle of the indicating pointer, fluctuations in temperature at the case of the instrument are corrected automatically. This compensating device is identical with that used in TAG recording thermometers.

The case is japanned-iron with a nickel-brass door 8 inches in diameter.

USE OF ELECTROSCOPE

A sensitive electroscope is the best means of detecting radio activity, states Dr. S. C. Lind in Bulletin 212 recently issued by the Department of the Interior through the Bureau of Mines.

Almost any type of instrument in which the substance to be examined can be introduced directly into

the charged instrument or near enough to an opening so that the radiation can enter will prove suitable. For substances of very weak activity, the main requirement of the instrument is that it shall be sensitive and have an extremely low natural electrical leak of its own. This latter requirement is not easily attained in laboratories where large quantities of radium are being handled; therefore, instruments used for the detection of very weak radio activity cannot easily be employed in such laboratories.

Ordinarily the chemical effects of the radiation and the coloring of minerals do not offer any convenient means of determining the presence of radio activity, although in certain minerals the presence of coloring —as, for example, the pleochroic rings in mica—have served to indicate the presence of radioactive substances. The production of scintillations has been used in some rather inaccurate methods for the measurement of minute quantities of radium or radium emanation, such as may be found in natural waters. As other methods are more accurate, the scintillation method is not recommended for practical use.

The use of the electroscope in detecting radio activity and for radio measurement is described in detail in Bulletin 212, which also gives analytical methods employed by the Bureau of Mines in the determination of various rare metals. Bulletin 212 may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of 40 cents.

SIX NEW DU PONT PRODUCTS

E. I. du Pont de Nemours & Co. announce the following new colors: Pontamine Blue GH Conc., Pontamine Yellow SXG, Lithosol Scarlet 3B, Pontachrome Blue SW, Lithosol Claret B and Pontamine Yellow SXR.

Pontamine Blue GH Conc. is an entirely new type of color. It is very highly concentrated and produces a blue of medium shade that penetrates very well, dyes evenly, and exhausts thoroughly and uniformly, making it adaptable for all types of cotton dyeing machines.

When applied at the boil on union goods the vegetable fibers are much more heavily covered than the animal fibers. The product can be discharged to a pure white with sulphoxylates.

Pontamine Yellow SXG, a new direct yellow, is in character like this company's Pontamine Yellow SX, manufactured for some time. The new yellow is of a greener, brighter shade, having all the fastness properties of the "SX" brand.

Lithosol Scarlet 3B is especially adapted for use in lakes. The lakes may be used for obtaining pink tints which are quite fast to light in lithographic inks and paints.

Pontachrome Blue SW is a product used according to the after-chrome method of dyeing for the production of Navy Blues; it is recommended for dyeing piece goods containing silk-effect threads to leave them unstained by the dyeing process; is a very level dyeing color and recommended for the dyeing of piece goods, giving an excellent penetration.

Lithosol Claret B is offered for the preparation of maroon lakes for paints, color, varnish, printing ink, and in pulp lakes for wall paper and coated paper.

Pontamine Yellow SXR is a new type of Pontamine Yellow. Others of this series are Pontamine Yellow SX and Pontamine Yellow SXG mentioned above. Pontamine Yellow SXR, therefore, has the same fastness properties and good solubility. It may be discharged with tin and hydrosulphite.

NEW HELINDONE COLOR

H. A. Metz & Co. announce the production of Helindone Brilliant Green 5G in paste and powder form. This is a new vat color of the Helindone series manufactured by Farbwerke vorm. Meister Lucius & Bruning, Hoechst-on-Main.

This product is reported to surpass other vat greens by reason of its remarkable purity of shade. It possesses excellent fastness to washing, boiling and cross-dyeing, while its fastness to light is sufficient for most requirements. If the usual precautions are taken the new brand may also be used for multi-colored bleached goods. It is suitable for machine dyeing, and will dye silk and artificial silk as well as cotton.

BEAVER ALIZARINE RED S

The Dunker & Perkins Company announces the first American production of Alizarine Red S (Schultz No. 780) by the Beaver Chemical Corporation, Damascus, Va.

This product is considered superior to the imported standard in strength, shade and general working properties. It produces a bright and brilliant shade of red when dyed on an aluminum mordant; light and dark shades of maroon when dyed by the chrome bottom method.

This product is being manufactured in quantities, with every facility to take care of any demands for American consumption.

H. A. METZ & CO., INC., ORIGINATES ACID WOOL DYE

With very few exceptions the dyestuffs produced in the United States to-day are duplications of products which have been known for a shorter or longer time.

It is of interest to the trade in general, therefore, to know that an entirely new wool dyestuff of great merit has been introduced by H. A. Metz & Co., Inc. The new shade is known as Brilliant Acid Blue 3B. It is an acid wool dyestuff of great strength, producing brilliant blue shades of satisfactory fastness to wash-

ing, wearing, and does not crock. It dyes level and can be used in combination with other acid dyestuffs. It may be used advantageously wherever a blue of great brilliance and strength at a reasonable price is desired.

Dyed samples showing this color as a self-shade and in combination with other colors constitute the feature of an insert included in this issue.

BLEACHING OF COTTON PIECE GOODS

(Continued from page 44)

chemic and some soluble matter are removed. The goods are squeezed and then run into an acid saturator similar to one described for chemicking. From the acid solution they pass through a squeezer and then to the acid piler, where they are allowed to stand until the acid has completely converted the insoluble mineral matter to soluble acid salts. Sulphuric acid is generally used in this operation; consequently, the salts are sulphates. To hasten the action this solution may be kept slightly warm—say, blood-heat—and the strength (½ to 1 per cent) is maintained by allowing strong acid to continually flow into the saturator sufficient to replace that taken out by the cloth. An electric resistance recorder may be used to advantage to maintain the required strength of the acid solution. One-half to three-quarters of an hour is sufficient to complete this acid reaction, and the goods pass from the acid piler to a washing machine similar to one previously described. In the washer they receive their final wash, which removes the excess acid and any soluble sulphates, etc. They are squeezed and piled in bins ready for drying.

Conclusion

In summing up, let us consider the questions of efficiency of apparatus, uniformity of quality, deliveries and costs. Starting at the singer, consider the efficient method of introducing the gas. Each and every molecule of gas is mixed with the proper amount of air which, when ignited, produces the maximum heat value, resulting in a greater saving of gas than other methods. Consider also the simplicity of control, one valve controlling each burner, which, in the writer's opinion, is as foolproof as possible, because any desired flame may be obtained at any time by opening or closing the valve and observing the pressure registered on the gauge.

Next let us consider the diataste piler. The warm, moist atmosphere surrounding the cloth as it lies in the piler is ideal to hasten the action of the malt enzymes upon the size starch. Therefore, the maximum conversion is brought about by a minimum of enzymes in the shortest possible time. Besides the saving of time and expense, the goods are treated uniformly, as each yard of cloth passing through the piler lies in it the same length of time, unlike cloth piled in a bin, where the top is exposed for a much shorter period than the bottom.

The washer, our next consideration, is so constituted that it not only forces the water used to exert its maximum cleansing action but also reduces to a minimum the tension exerted lengthwise on the cloth as it is pulled through the machine. This reduces damages, broken seams and frays, on light goods especially, and allows more of a chance for the finisher to get his required width on the tension frames without damaging the selvedges.

With the goods entering the kier soft and as free as possible from soluble matter and mechanically held impurities, a good boil may be expected with a reduced strength of caustic soda. Years ago the gray mills used nothing but the best cotton in constructing their cloths. Tallow and the best grades of oils were used, with pure starch for sizing; but to-day even waste and reworked cotton and substitutes of all kinds are used in the size, some of these giving the bleacher untold trouble if not removed before the boil. Many classes of goods may be thoroughly bottomed in one boil that otherwise would require two. The asbestos covering preventing radiation saves on steam consumption, thus reducing the cost of the boil. The temperature recording thermometer not only aids the kier boiling in controlling the bill but gives a positive record of each boil for future reference.

The gray washer similar to Fig. 4 removes any soluble matter left in the goods after boiling. The clean goods are now ready for bleaching or mercerizing, as the case may be. The method of mercerizing, as previously stated, may vary with the class of goods and the price received for this operation. However, the cost may be kept very low, if conditions warrant, by installing an up-to-date caustic recovery plant to recover the caustic in the wash water.

The bleaching operation described is the last word in bleaching from an economical point of view. The strength of the chemic is under constant control. The bleaching proper is done in the shortest possible time, and is absolutely uniform, because each yard of goods is exposed for exactly the same length of time. It is under absolute control, as the bleacher can see his results readily as the operation progresses. Labor is cut to a minimum, one man running both the gray washer and the piling machine, while with bins it would require a man to plait the goods in the bin and a man on the washer and saturator. Floor space, an expensive item in modern manufacturing, is cut to a minimum, as the piler takes up considerably less space than the chemick bins of the older methods.

The souring process has similar advantages. The white bins are subdivided to accommodate small lots; this is a handy way to get rush lots through the plant and thus be able to keep promises on these lots. For-

merly the converter generally handled large lots at a time, but to-day there are so many in the business and conditions are such that instead of handling 25,000 to 100,000 or even greater to a lot, they run from 2,000 to 25,000 yards. These small lots require more planning and attention on the bleacher's part.

Not only is the quality of the work higher and the time it takes reduced, but also the general appearance of the bleach house is greatly improved. The numerous poteyes, reels, belts and shafting are eliminated, thus preventing oil spots, etc., from the overhead appliance coming in contact with the goods.

As the whole bleaching process is practically continuous with the exception of the boil, the planning room can get the work through according to schedule without much trouble.

CHEMICAL LECTURES AT CARNEGIE

During February and March a series of five public lectures on chemical engineering problems will be given at Carnegie Institute of Technology in Pittsburgh under the joint auspices of the institute and the Chemical Equipment Association. The series, according to the announcement, will be for the benefit of the executives and scientists of the Pittsburgh district. Special invitations to a large number of residents of the district have been issued by President Thomas S. Baker, of Carnegie Tech.

The series will cover important problems in the use of chemical equipment and metallurgical industries, and in many others that are usually considered as mechanical industries.

The schedule of lectures as announced by the institute includes in part the following subjects:

Thursday, February 14—Prof. W. L. Badger, University of Michigan; "Evaporation."

Thursday, March 13—F. M. Turner, Jr., Chemical Catalog Company, New York; "Crushing, Grinding, Sifting and Mixing Equipment."

Friday, March 20—Dr. Fred C. Zeisberg, chemical department of E. I. du Pont de Nemours & Co.; "Equipment Phases of Nitric and Sulphuric Acid Manufacture."

C. C. YOUNG JOINS FORTNER COMPANY

The L. B. Fortner Company has announced to the trade that Charles C. Young, former manager at Boston for the Bayer Company and at Providence for the National Aniline & Chemical Company, has become associated with its Boston office. Mr. Young has had a wide and varied experience in the handling of dyestuffs and is exceptionally well known throughout New England dyestuff circles. We feel very confident that his friends will wish him every success in his new connection.

A. S. T. M. SPECIFICATIONS AND METHODS OF TEST FOR TEXTILE MATERIALS

The American Society for Testing Materials is a national technical society of some 3,400 members from all parts of the United States, Canada, and many foreign countries, organized for "the promotion of knowledge of the materials of engineering and the standardization of specifications and methods of testing." These objects are attained by the presentation and discussion, at annual meetings, of scientific and technical papers and committee reports.

A new pamphlet issued by the Society contains the methods of testing, definitions of terms and specifications for textile materials developed, and a selection from reports and papers relating thereto that have appeared in the Proceedings. It is published for the purpose of presenting in a single cover data that the Society believes to be of much importance to all who deal with textile materials.

The activities of the Society in the study of tests and specifications for textile materials are in the hands of its Committee on Textile Materials. This committee was organized in 1914 and took up as its first problem the development of methods of testing cotton fabrics. The committee has presented well-considered reports and papers relating to its activities, the most important of which are presented herewith. In 1915, the committee submitted Tentative Methods of Testing Cotton Fabrics, which in 1920, after five years' trial, were amended in certain particulars and adopted as the Society's standard. In the meantime, specifications for imperfections and tolerances for square-woven and cord tire fabrics were being developed; and methods of testing were prepared to cover tests for cotton yards and cords and cotton fibers. The committee has also met the need of clearly defining many of the terms relating to textile materials. With its work in the field of mechanical cotton fabrics well under way, the committee is now planning to extend its activities into other fields wherein textile materials are used for engineering purposes.

Further information regarding the activities of the Society and Committee D-13 may be obtained by addressing the Society at its headquarters, 1315 Spruce Street, Philadelphia, Pa.

Antiseptic Properties of Dyes and the Fastness to Light.—In a recent article published in the Journal of the Society of Dyers and Colourists, 39, p. 214, David Brownlie offers the theory that the fading of direct cotton colors by light is due to bacterial or enzyme action. He supports his views by the fact that colors derived from monohydric phenols which are highly antiseptic are comparatively fast to light, whole those derived from phenolic bodies containing more than one hydroxyl group which are less antiseptic are fugitive to light.

RECENT TRADE PUBLICATIONS

A new folder distributed by John Campbell & Co. describes Camelite, a stripping compound manufactured by them, and Hemadol, recommended for dyeing all grades of silk, wool and leather. Of the former product the folder states: "The advantage of using Camelite . . . is that it requires only half the time to do the stripping. It is free from any acid or alkali and leaves the stock with a good 'feel.'" Hemadol, as described in the circular, to-day is finding favor in silk and woolen mills where Hematine Paste was formerly used, and produces excellent blue tones and blue blacks which can be shaded by the addition of fustic extract in the dye bath to produce jet shades.

The National Aniline & Chemical Company has issued two new color cards—"Dyes for Lakes" and "Dyes for Cotton and Silk." The lake card, an innovation, contains formulas for forty colors; the colors themselves, exhibited in the usual card-folder form, appear exceedingly smooth and pleasing.

The second card shows a series of dyeings on both silk and cotton piece goods, demonstrating the results of certain acid and direct dyes on these two fibers. The first twenty-four swatches show neutral dyeing acid colors which leave cotton practically unstained; the methods used are explained in the folder. The next set of swatches show the cotton colors on both cotton and silk, indicating that by their use the silk is left quite clear. The last series of twenty panels, showing mixtures in both solid and two-tone effects, are particularly brilliant and give excellent examples of the pleasing effects obtained by different color combinations. The formulas for these dyeings are also given in the folder.

The Seydel Chemical Company recently mailed out a reprint of an article entitled "The Expanding Use of Benzoates," by E. E. Smith. This paper tells the history and results of experiments with benzoic acid and its sodium salt, sodium benzoate, and of their wide use in food preservation, intermediate manufacture and medicinal chemistry.

In the section treating of its use in dye manufacture the author says: "In the manufacture of dyes, benzoic acid is employed in the production of Alkali Blue, Alizarine Brown, Anthracene Brown, and para amino benzoic acid is used in producing azo dyestuffs."

The Seydel company has prepared a booklet dealing with this subject, benzoates, and will be glad to send it to anyone interested.

CARBOY BOX COMPANY EXPANDS

The Hercules Carboy Box Company, of Newark, N. J., has just completed the erection of a new addition to its plant in order to extend its facilities in the manufacture of Hercules carboy boxes for the shipment of acids in glass carboys.

SURPLUS DYESTUFFS FOR SALE

3,790	pounds	Chrome Fast Blue 2R (Swiss)
1,390	"	Aminogene Blue RN (Swiss)
836	"	Curcuphenine (British)
11,000	"	Sulphur Green
20,000	"	Sulphur Brown
17,000	"	Sulphur Cutch

Make offer. Samples upon application. Address Box 235, American Dyestuff Reporter.

WANTED—An aniline color chemist. Experienced in testing foreign and domestic colors. Must be capable, and have initiative. Also be able to demonstrate in mills. Address Box 241, American Dyestuff Reporter.

SALES MANAGER—EXECUTIVE

Thirty years' varied experience in the dyestuff business, associated with the most representative importing and domestic houses, holding positions of wide responsibility. Thorough acquaintance with all types of dyestuffs, and requirements of prominent consumers. Unqualified credentials. Presently available. All communications confidential. Address Box 242, American Dyestuff Reporter.

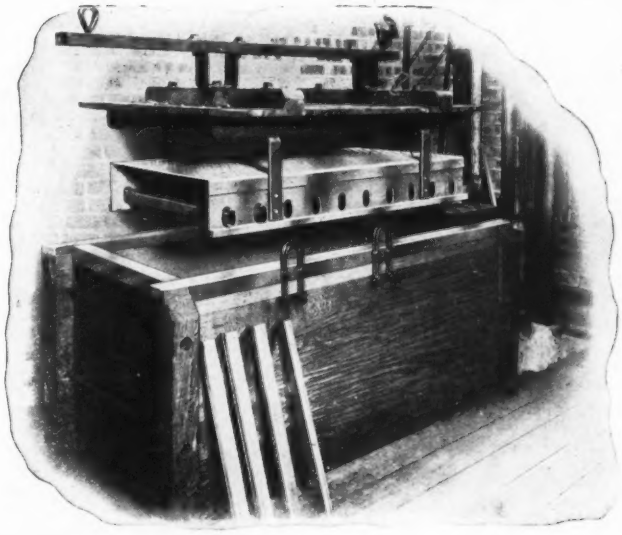
WANTED—LIVE-WIRE SALESMEN

WANTED—Live Wire Salesmen, who call and sell Acid or Alkili direct to the trade, and can handle a side line. To sell a Carboy Holder that draws acid by the drop. Pays for itself by saving all drainage. Made of steel, cannot be broken, endorsed by safety institutes, used by United States Testing Laboratories, and will fit any size carboy. Write giving connections and standing to Safety Carboy Holder Company, 340 W. 42nd Street, New York City. Large commissions. Easy seller.

Opportunity for young man, having practical experience in the uses and applications of textile and leather softeners, sizes, and finishes, and able to introduce these, and satisfactorily demonstrate in the mill. One with sales ability and known to consumers, and having knowledge of the manufacture of these products will be given the preference. Reply fully, stating experience in detail, salary desired, reference, etc. Address Box 243, American Dyestuff Reporter.

Large manufacturing and selling corporation wants well connected Southern agent or representative with headquarters in Atlanta or Chattanooga, to sell on commission a line of heavy chemicals, dyestuffs, sizing and finishing materials, soluble oils, etc. Only responsible and well connected applicants considered. Give complete data in first letter. Address Box 244, American Dyestuff Reporter.

Tank lining, cages, shafts, propellers, dye sticks, bolts and fittings— *all are Monel Metal*



50-lb. Monel Metal skein dyeing machine at the Schlake Dye Works, Chicago, Ill., Made by HUSSONG DYEING MACHINE CO. GROVEVILLE, N. J.

IN other words, every part of this skein dyeing machine that comes in contact with the liquor is made of Monel Metal.

The use of this metal for dyehouse equipment insures genuine economy. For Monel Metal with its corrosion resisting properties and its steel-like strength gives real satisfaction through years of severe usage.

Monel Metal surfaces are easily cleaned. Many different colors can be dyed in the same Monel Metal machine. A simple washing out quickly removes all trace of previous color. Floor space is thereby saved, as one machine does the work of many.

In many plants this machine is likewise used for bleaching. It is also adaptable for carbonizing by simply changing the cage.

The best indication that Monel Metal machines of this type are giving general satisfaction is to be found in the fact that carpet and rug manufacturers the country over are using them.

Monel Metal is without an equal for all dyehouse service.

If you have a dyeing problem why not consult us. Address

Now — Hot rolled rods and sheets — cold drawn rods — of pure Nickel are available at important distribution points throughout the country.

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In addition to our well-known:

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Silk Brown R

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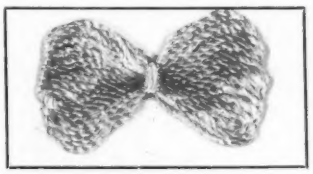
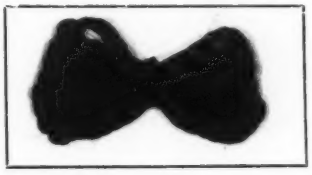


Newport Anthrene Yellow G Paste

Newport Anthrene Blue GCD Paste



Newport Anthrene Black B Double Paste

Newport Anthrene Jade Green Paste

The use of artificial silk has been steadily gaining until now it is being utilized in such places as dress goods, shirtings, suitings, draperies, etc., where great color destroying influences will naturally be exerted. With this condition it is often by no means desirable to sacrifice brilliancy and it is not necessary to do so because the problem is easily solved by the use of

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and service

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GOOD MEN TO KNOW

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BY MAKING USE OF

THEIR WIDE AND PRACTICAL WORKING KNOWLEDGE GAINED THROUGH INTENSIVE TRAINING IN ALL BRANCHES OF COLOR APPLICATION

AND

THOROUGH SCHOOLING FROM EXTENSIVE PRACTICAL WORK YOU INSURE YOUR RESULTS.

Ask us to let our men help you get the most out of

NEWPORT COLORS

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Passaic, New Jersey

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Gives more body and a desirable handle.

For the best results in dyeing, bleaching, mercerizing and finishing of cotton, wool and silk, try this specialty.

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in Powder

for Wool and Silk Dyers

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2% AKCO Chromate Brown
½% AKCO Chromate Yellow
¼% AKCO Chromate Gray
2% Bichromate of Potash
2% Oxalic Acid
½% Ammonia

When entering stock, have dye bath at about 90 deg. Fahr. Raise temperature slowly to boil. Run 2½ hours to shade.

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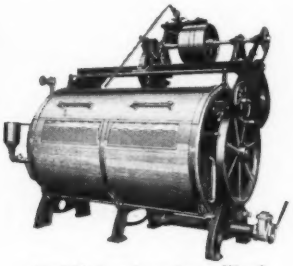

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During the present business condition the manufacturers who have insured their demand by Advertising are in a far better position—in every way—than those who have trusted to the current demand that was not of their creating.

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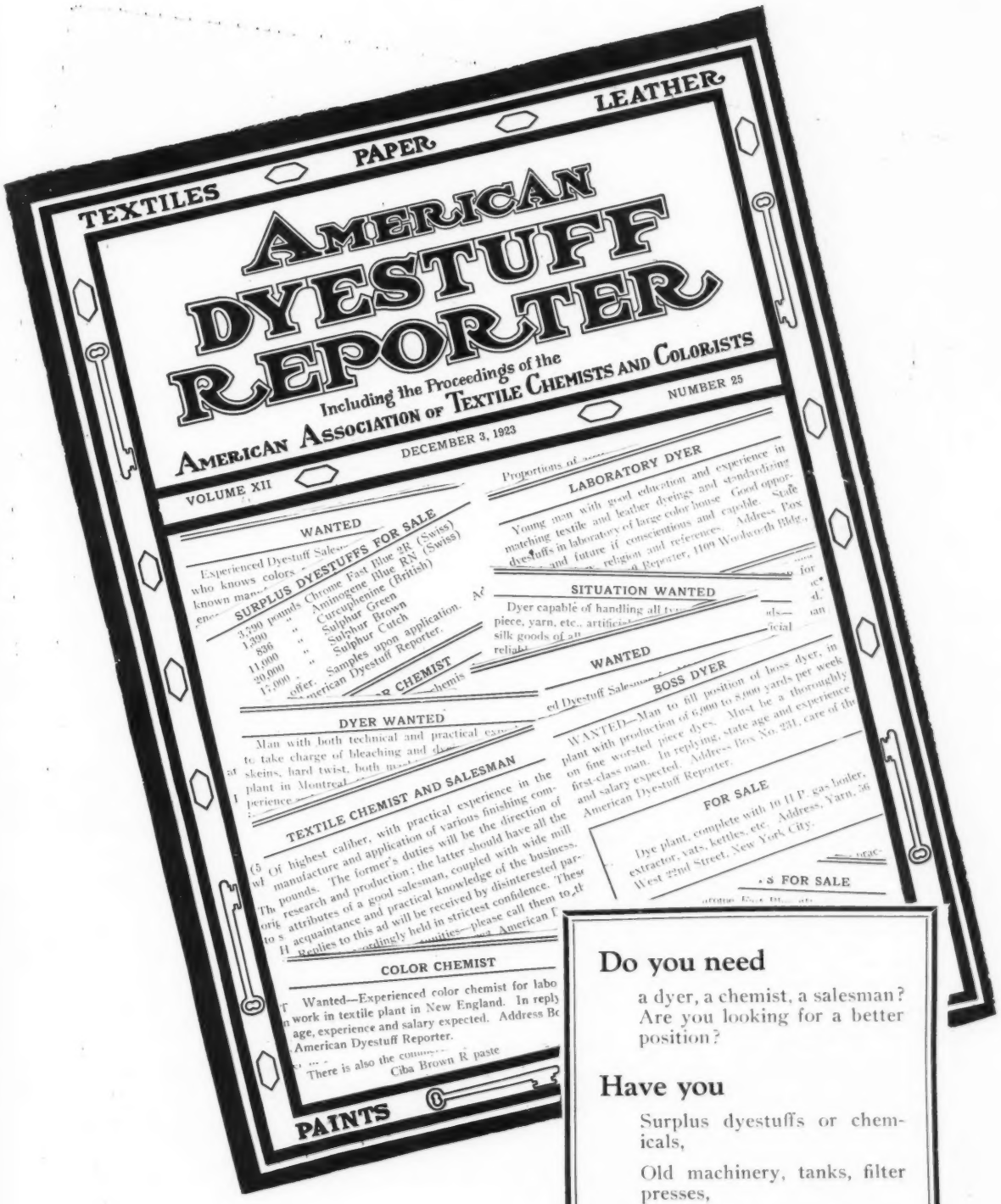

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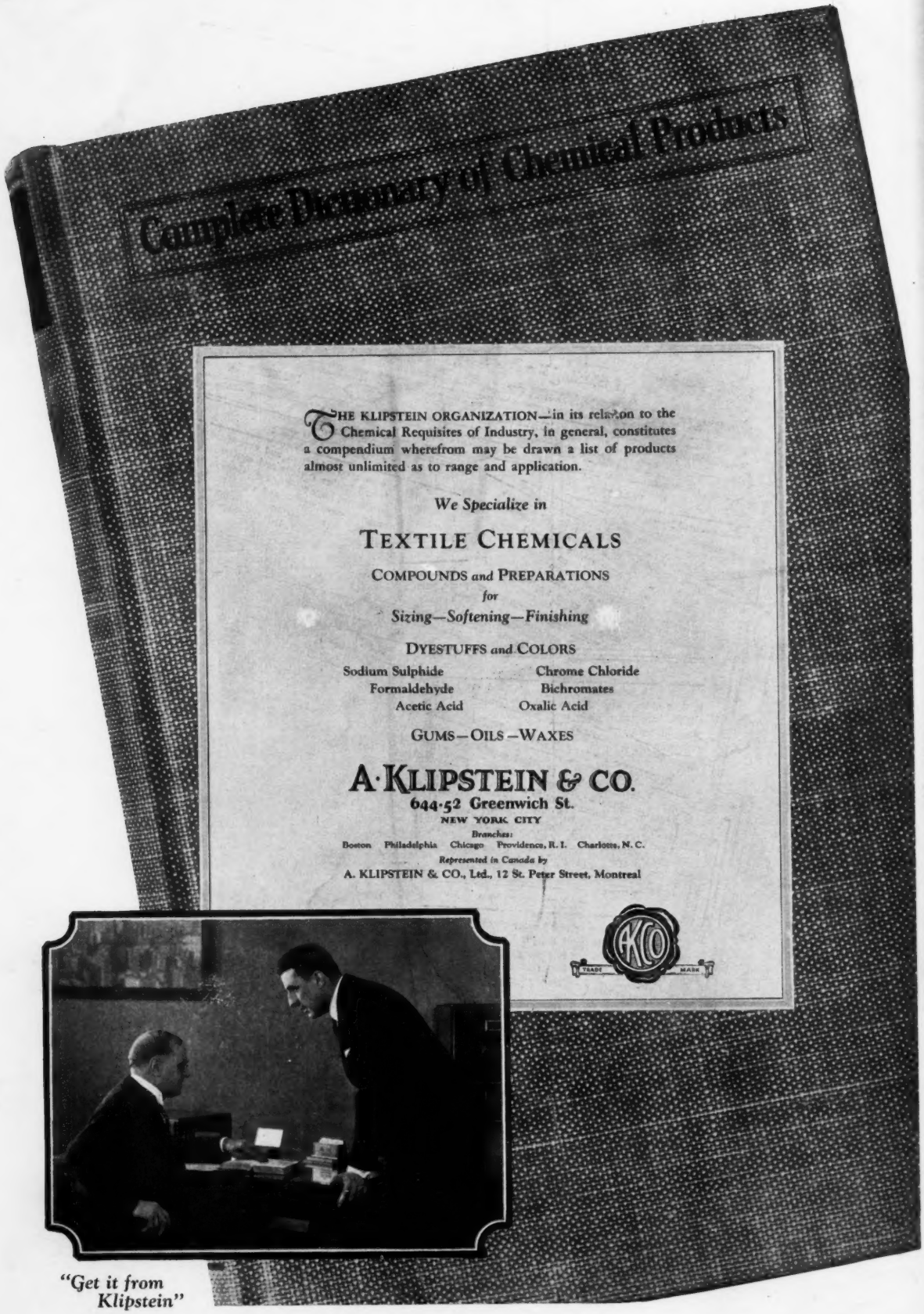

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